United States Court of Appeals

for the Second Circuit

APPENDIX

76-7063

UNITED STATES COURT OF APPEALS

SECOND CIRCUIT

Digitronics Corp., Now Amperex Electronic Corp.,	
Plaintiff-Appellant-Appellee,	
v.	Docket No.
The New York Racing Association, Inc., Automatic Totalisators (U.S.A.) LTD., Automatic Totalisators LTD., and Premier Equipment Proprietary LTD.,	76-7063
Defendants-Appellees-Appellants.	

Appeal From the United States District Court
For the Eastern District of New York
(John F. Dooling, Jr., District Judge)

DEFERRED JOINT APPENDIX

Volume I, Pages A1-A686

New York, N.Y.
September 2, 1976

Of Counsel
Yuter & Rosen
Daniel M. Rosen
Wallace E. J. Collins

Counsel for Appellant

S. C. Yuter
Yuter & Rosen
605 Third Avenue
New York, N.Y. 10016
212-986-1221

PAGINATION AS IN ORIGINAL COPY

DEFERRED JOINT APPENDIX

TABLE OF CONTENTS

		PAGE
(1)	Relevant Docket Entries in the Proceedings Below	A1
(2)	Relevant Portions of the Pleadings	
	Amended and Supplemental Complaint	A6
	Amended Answer of Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd.	A10
	Amended Answer of Defendant, Automatic Totalisators (U.S.A.) Ltd. to the Amended and Supplemental Complaint	A18
	Amended Answer of Defendant, The New York Racing Association, Inc. to the Amended and Supplemental Complaint	A27
	Plaintiff's Reply to Second Counterclaims Filed by Automatic Totalisators (U.S.A.) Ltd., Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd.	A35
(3)	Judgment, Orders, Findings and Memoranda in Question	
	Memorandum and Order dated September 16, 1975	A39
	Findings of Fact and Order for Judgment dated September 16, 1975	A275
	Judgment dated September 22, 1975	A296
	Memorandum and Order dated January 13, 1976	A298
(4)	Parts of the Record Designated by Parties	
	Weida et al Patent in Suit (Exhibit 1)	A301
	Additional Plaintiff's Exhibits	A323
	Defendants' Exhibits	A831
	Transcript Pages	A981

PAGE

Miscellaneous

Affidavit of S. C. Yuter dated October 29, 1975 (together with attached Exhibits A-C and cross-referenced Combined Plaintiff's Motions ...) A1355

Affidavit of Robert L. Weida dated October 29, 1975 ..... A1365

Supplemental Affidavit of Robert L. Weida dated November 6, 1975 ..... A1368

Second Supplemental Affidavit of Robert L. Weida dated December 10, 1975 (together with attached Exhibits 1-4) A1374

Affidavit of S. C. Yuter dated December 10, 1975 (together with attached Exhibits A-E and cross-referenced Plaintiff's Opposition to Defendants' Motion Under Rule 59(e) ...) A1391

Plaintiff's Classification Definitions of Classes Searched by Examiner During Prosecution of Weida et al Patent No. 3,252,149 (dated June 9, 1975) A1424

(5) Letters dated January 15, 1970 and July 1, 1970 from plaintiff's counsel to American Totalisator Co.'s counsel re infringement of patent in suit A1427

(6) Additional Exhibits Cited in Reply Brief of the Appellant A1429

(1) RELEVANT DOCKET ENTRIES IN THE PROCEEDINGS BELOW

Civil Docket 67 C 1119

Date	Filings - Proceedings	Entry No.
1-27-67	Complaint	1
2-18-67	Summons	2
2-9-68	Answer of deft Automatic Totalisators (U.S.A.) Ltd.	9
2-9-68	Answer of deft The New York Racing Association Inc.	10
4-29-68	Order to show cause & Memorandum dismissing action as against Automatic Totalisators (U.S.A.) Ltd.	14/15
5-2-68	Notice of Motion filed by pltff to vacate Staying Order	16
5-7-68	Order to show cause assigning action to a judge for all purposes	23
6-28-68	Decision rendered on motion to dismiss pltff's cross motion vacating further discovery is denied	26
6-28-68	Decision rendered on motions for discovery etc.	27
6-28-68	Decision rendered that motion assigning action to a single judge etc. is denied	28
9-27-68	Order that hearing be marked off subject to restoration	29
10-8-68	Order re discovery	30
4-26-69	Depositions of Keith Dodwell filed	34
3-16-70	Notice withdrawal of motion to dismiss deft Automatic Totalisators (U.S.A.) Ltd.	44
8-10-70	Decision on pltff's motion to serve amended & supplemental complaint	51
10-29-70	Order granted to pltff Digitronics to file and serve an amended and supplemental complaint	57
11-4-70	Amended & Supplemental Complaint	58

Date	Filings - Proceedings	Entry No.
11-18-70	Answer of deft Automatic Totalisators (U.S.A.) Ltd.	59
11-18-70	Answer of deft N. Y. Racing Association Inc.	60
11-27-70	Summons - Premier Equipment Proprietary Ltd.	61
2-11-71	Answer of deft Premier Equipment Proprietary Ltd.	63
2-11-71	Answer of deft Automatic Totalisators Ltd.	64
1-4-73	Deft's notice pursuant to 35 USC 282	79
4-11-73	Amended answer of defts Automatic Totalisators Ltd. & Premier Equipment Proprietary Ltd.	83
4-11-73	Amended answer of deft N. Y. Racing Association	84
4-11-73	Amended answer of deft Automatic Totalisators (U.S.A.) Ltd.	85
4-10-74	Amplified notice pursuant to 35 U.S.C. 282	111/112
5-6-74	Notice of motion to amplify amended answers and add a counterclaim	113
6-6-74	Notice of motion for separate and preliminary trial of certain issues and for referral thereof to a special master and Order	114
6-6-74	Notice of Motion to add a Second Counterclaim and to amend the prayer for relief of defts	115
7-1-74	Deposition of Eugene Leonard	120
7-1-74	Deposition of Joseph Lynch	121
7-2-74	Order denying motion for separate trial of issue of fraud	--
7-11-74	Pltff's reply to second counterclaims by Automatic Totalisators Ltd.	122
11-13-74	Deposition of George E. Ernst	131

Date	Filings - Proceedings	Entry No.
11-15-74	Memorandum and order that trial date final	132
11-20-74	Supplemental notice pursuant to 35 U.S.C. 282	135
12-17-74	Deposition of Robert Weida	137
12-19-74	Before Dooling, J. - Case called - Trial ordered and begun	
12-20-74	Trial resumed	
12-23-74	Trial resumed	
12-24-74	Trial resumed	
12-26-74	Trial resumed	
12-27-74	Trial resumed	
12-30-74	Trial resumed	
12-31-74	Trial resumed	
[1-2-75	Trial resumed] *	
1-3-75	Trial resumed	
1-6-75	Trial resumed	
1-7-75	Trial resumed	
1-7-75	Deposition of Newman F. Presson	143
1-8-75	Trial resumed	
1-9-75	Trial resumed	
1-10-75	Trial resumed	
1-13-75	Trial resumed	
1-14-75	Trial resumed	
1-14-75	Deposition of Camil P. Spiecens	144

* Brackets indicate three of the 25 trial days omitted from docket entries.

Date	Filings - Proceedings	Entry No
1-15-75	Trial resumed	
[1-16-75	Trial resumed] *	
1-17-75	Trial resumed	
1-20-75	Trial resumed	
[1-21-75	Trial resumed] *	
1-22-75	Trial resumed	
1-22-75	Deposition of David Warren	145
1-23-75	Trial resumed	
1-27-75 [1-24-75]	Trial resumed. Trial concluded.	
9-16-75	Memorandum and Order dtd 9-16-75 finding judgment in favor of the deft	178
9-16-75	Findings of Fact and Order for Judgment dtd 9-16-75	179
9-22-75	Judgment dtd 9-19-75 (Approved by Dooling, J.) that the pltff take nothing and the complaint is dismissed; that claims 20-27 inclusive of U.S. Patent No. 3,252,149 are invalid and have not been infringed by the defts; and that the second counterclaim of deft Automatic Totalisators (U.S.A.) Ltd. is dismissed on the merits etc.	182
10-2-75	Combined pltff's motions to amend and supplement findings of fact and conclusions of law, alter or amend the judgment and extend the time to supplement these motions	183
10-2-75	Notice of motion under Rule 59(e) to amend or alter judgment	184
10-2-75	Memorandum in support of defts' motion	185
10-2-75	Affidavit of Alfred Giardino	186
10-3-75	Order that oral argument on motion of pltff will be heard	187

Date	Filings - Proceedings	Entry No.
10-30-75	Notice of motion re reopen discovery to permit pltff to oppose defts' motion	188
11-6-75	[Defts'] Motion to amend judgment argued	
11-7-75	Supplemental affidavit of Robert L. Weida	189
12-11-75	Letter to J. Dooling from S. C. Yuter with pltff's substituted motion to supplement and amend findings of fact	190
1-13-76	Memorandum and Order dtd 1-13-76 denying pltff's motion to amend the findings under Rule 52(b) and denying defts' motion to amend the judgment	192
2-11-76	Notice of Appeal	193
2-23-76	Notice of cross appeal	194

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION,

Plaintiff,

v.

THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD., and PREMIER EQUIPMENT PROPRIETARY LTD.,

Defendants.

Civil Action No. 67C1119

on Patent No. 3,252,149

FILED
IN CLERK'S OFFICE
U.S. DISTRICT COURT E.D. N.Y.
★ NOV 4 1970 ★
TIME A.M.
P.M.

AMENDED AND SUPPLEMENTAL COMPLAINT FOR INFRINGEMENT OF UNITED STATES LETTERS PATENT

TO THE HONORABLE THE JUDGES OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK:

Plaintiff for its Complaint alleges that:

1. Plaintiff, Digitronics Corporation, is a corporation of the State of Delaware.

2. Defendant, The New York Racing Association, Inc., is a corporation of the State of New York and has a regular and established place of business and has committed the acts of infringement hereinafter alleged within the Eastern District of New York.

3. On information and belief, Defendant, Automatic Totalisators (U.S.A.) Ltd., a wholly-owned subsidiary of Defendant Automatic Totalisators Ltd., is a corporation of New South Wales, Australia, and has a regular and established place of business and has committed the acts of infringement hereinafter alleged within the Eastern District of New York.

4. On information and belief, Defendant, Automatic Totalisators Ltd., is a corporation of New South Wales, Australia, and has a regular and established place of business and has committed the acts of infringement hereinafter alleged within the Eastern District of New York.

5. On information and belief, Defendant, Premier Equipment Proprietary Ltd., a wholly-owned subsidiary of Defendant Automatic Totalisators Ltd., is a corporation of New South Wales, Australia, and has a regular and established place of business and has committed the acts of infringement hereinafter alleged within the Eastern District of New York, since January 1, 1968.

6. This is a Civil Action arising under the Patent Laws of the United States for infringement of United States Letters Patent.

7. On May 17, 1966, United States Letters Patent No. 3,252,149 was duly and legally issued to Digitronics Corporation at Albertson, Long Island, New York, a corporation of the State of Delaware, as assignee of Robert L. Weida, Edward M. Richards, Evelyn Berezin, Jack Knoll and Philip Rosenblatt, the inventors thereof, for inventions in a Data Processing System, and since that date Plaintiff has been and still is the owner of such Letters Patent.

8. Defendants, Automatic Totalisators Ltd., and Automatic Totalisators (U.S.A.) Ltd., have used, and on information and belief offer to manufacture, sell and use, Data Processing Systems and have been and still are aiding, abetting, inducing and contributing to the sale and use of such Data Processing Systems by others, including their associate company Premier Equipment Proprietary Ltd., a corporation of New South Wales, Australia, and Defendant, The New York Racing Association, Inc.

BEST COPY AVAILABLE

9. Defendant, The New York Racing Association Inc. has been using and continues to use a Data Processing System.

10. The Data Processing Systems referred to in paragraphs 8 and 9 have been and still are utilizing inventions of aforesaid Letters Patent No. 3,252,149 and the aforesaid manufacture, sale, and use of such Data Processing Systems constitute infringement of said Letters Patent No. 3,252,149 by Defendants and will continue to do so unless enjoined by this Court.

11. Plaintiff has given Defendants Automatic Totalisators Ltd., Automatic Totalisators (U.S.A.)Ltd., and The New York Racing Association prior notice of their infringement of aforesaid Letters Patent No. 3,252,149, and upon information and belief Defendant Premier Equipment Proprietary Ltd., has been given prior notice of its infringement of aforesaid Letters Patent No. 3,252,149.

12. Plaintiff is informed and believes, and therefore avers, that Defendants have continued and are continuing and threaten to continue said infringement in defiance of Plaintiff's rights as hereinabove alleged.

WHEREFORE PLAINTIFF PRAYS:

1. That an injunction may issue against further infringement by Defendants and all those controlled by or in privity with Defendants.

2. That an accounting be ordered for damages suffered by Plaintiff by virtue of aforesaid infringement.

3. That the costs of this Action be assessed against Defendants.

4. That Plaintiff may have such other and further relief as the equities of the case may require and as may to this Court seem meet and just.

DIGITRONICS CORPORATION

YUTER & FIELDS

By Paul Fields
A Member of The Firm
Attorneys For Plaintiff
605 Third Avenue
New York, New York 10016
212 YUkon 6-1221

New York, New York

Dated: November 4, 1970

Of Counsel:

S. C. Yuter
Paul Fields
605 Third Avenue
New York, New York 10016
212 YUkon 6-1221

Russell G. Pelton
100 East 42nd Street
New York, New York 10017
212 MUrray Hill 2-0660

A10

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, Plaintiff, v. THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD., and PREMIER EQUIPMENT PROPRIETARY LTD., Defendants.	Civil Action No. 67C1119 on Patent No.- 3,252,149 AMENDED ANSWER OF AUTOMATIC TOTALISATORS LTD. AND PREMIER EQUIPMENT PROPRIETARY LTD.

COME NOW defendants, Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd., and further answer, by their attorney and pursuant to the order of the Honorable Max Schiffman dated March 21, 1973, the amended and supplemental complaint of Digitronics Corporation, the numbered paragraphs herein corresponding to the similarly numbered paragraphs in the amended and supplemental complaint, as follows:

1. Admit the allegations of paragraph 1 of the amended and supplemental complaint.

2. Admit on information and belief the allegations of paragraph 2 of the amended and supplemental complaint, except deny on information and belief that defendant The New York Racing Association, Inc. has committed any act of infringement within the Eastern District of New York, or elsewhere.

3. Admit the allegations of paragraph 3 of the amended and supplemental complaint, except deny on information and

belief that defendant Automatic Totalisators (U.S.A.) Ltd. has a regular and established place of business in the Eastern District of New York and deny on information and belief that it has committed any act of infringement within the Eastern District of New York, or elsewhere.

4. Admit the allegations of paragraph 4 of the amended and supplemental complaint, except deny that Automatic Totalisators Ltd. has a regular and established place of business in the Eastern District of New York and deny that it has committed any act of infringement within the Eastern District of New York, or elsewhere.

5. Admit the allegations of paragraph 5 of the amended and supplemental complaint, except deny that defendant Premier Equipment Proprietary Ltd. has committed any act of infringement within the Eastern District of New York, or elsewhere.

6. Admit that the amended and supplemental complaint purports to allege a claim under the Patent Laws of the United States for infringement of United States Letters Patent.

7. Admit that United States Patent No. 3,252,149 entitled "Data Processing System" was issued on May 17, 1966, to Digitronics Corporation of Albertson, New York, a corporation of the State of Delaware, as the assignee of Robert L. Weida, Edward M. Richards, Evelyn Berezin, Jack Knoll and Philip Rosenblatt, but deny that said patent was duly and legally issued, that said patent was for an invention, that any

invention is described or claimed therein or that any of the said named individuals are inventors or have made any inventions. Defendants are without sufficient knowledge to form a belief as to whether the plaintiff still is the owner of said patent and therefore deny the same.

8. Admit that Automatic Totalisators Ltd. and Automatic Totalisators (U.S.A.) Ltd. are engaged in the use, manufacture and sale of data processing systems and admit that Premier Equipment Proprietary Ltd. is engaged in the operation and servicing of data processing systems and deny each and every other allegation of paragraph 8 of the amended and supplemental complaint.

9. Admit on information and belief the allegations of paragraph 9 of the amended and supplemental complaint.

10. Deny each and every allegation of paragraph 10 of the amended and supplemental complaint.

11. Admit that prior to the service and filing of the amended and supplemental complaint defendant Automatic Totalisators Ltd. received notice that plaintiff claimed infringement of aforesaid Letters Patent No. 3,252,149.

12. Deny each and every allegation of paragraph 12 of the amended and supplemental complaint.

FIRST AFFIRMATIVE DEFENSE

13. Venue is not properly laid in this District as to either defendant since:

(a) the defendant, Automatic Totalisators Ltd., does not reside in this District, has no regular and established place of business in this District, and has committed no act of infringement in this District; and

(b) the defendant, Premier Equipment Proprietary Ltd., does not reside in this District, and has committed no act of infringement in this District.

SECOND AFFIRMATIVE DEFENSE

14. On information and belief Patent No. 3,252,149 is invalid in that:

(a) The alleged invention thereof was known or used by others in this country or patented or described in a printed publication in this or in a foreign country before the invention thereof by the applicants for the said patent.

(b) The alleged invention thereof was patented or described in a printed publication in this or in a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for the patent in the United States.

(c) The applicants for the patent did not themselves invent the subject matter sought to be patented thereby.

(d) The differences between the subject matter sought to be patented in the patent and the prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which the subject matter of the said patent pertains.

(e) Before the earliest date upon which the applicants for said patent are entitled to rely as the date of their alleged invention, the alleged invention sought to be patented therein was, in all material and substantial respects, made in this country by others who had not abandoned, suppressed or concealed it.

(f) The description of the alleged invention, and the manner and process of making and using it, in the specification is not in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make, construct, practice, or use the same.

(g) The claims of the patent do not particularly point out and distinctly claim the subject matter of the alleged invention.

(h) By reason of the proceedings in the United States Patent Office during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the admissions and representations therein made by and on behalf of the applicants in order to induce the grant of said patent, plaintiff is estopped to claim for United States Letters Patent No. 3,252,149 a construction, were the same otherwise possible (which is denied), such as would cause said patent to cover or include any act of defendant of which plaintiff has complained.

(i) By reason of the proceedings in the United States Patent Office in conjunction with and during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the nature, scope and extent of the representations and other actions taken or made by or on behalf of the applicants therein in order to induce the grant of said patent, the Commissioner of Patents was induced to mistakenly issue the United States Letters Patent No. 3,252,149 and that said Letters Patent is unenforceable by the plaintiff herein.

(j) That, upon information and belief, in an attempt to secure a coercive position of exclusivity in the field of electronic totalizators for parimutuel betting operations, plaintiff filed application Serial No. 268,743 for the patent in suit on March 28, 1963 improperly seeking claims directed to dominate current activities in the electronic

totalizator parimutuel betting field which incorporated developments and contributions of others than the named inventors thereof. On information and belief, in furtherance thereof, and during the proceedings in the United States Patent Office in conjunction with and during the prosecution of the said application which resulted in the issuance of United States Letters Patent No. 3,252,149, the applicants failed to fulfill their duty to bring to the attention of the Patent Office, and wilfully withheld therefrom, relevant prior art known to the applicants or their attorneys or which should have been so known through the exercise of reasonable care and diligence, including the existence of a prototype electronic totalizator made and sold by plaintiff to Westbury Electronic Corp. and publicly operated and demonstrated before March 28, 1962; the existence of a printed publication of Westbury Electronic Corp. before March 28, 1962 that described and disclosed the subject matter of the patent in suit and of U.S. Patent No. 2,479,681. On information and belief, such actions constituted misrepresentation in the nature of willful and knowing breach of applicant's duty to inform the Patent Office of material facts with the intent to induce the issuance of the patent in suit and the Commissioner of Patents was induced to mistakenly issue such United States Latters Patent No. 3,252,149 and that said Letters Patent is unenforceable by the plaintiffs herein.

15. Defendants will give notice in writing, to plaintiff at least thirty (30) days before trial, of the country, number, date, and name of the patentee of any patent, the title, date and page numbers of any publication to be relied upon as anticipation of the patent in suit or as showing the state of the art, and the name and address of any person who may be relied upon as the prior inventor or as having prior knowledge of or as having previously used or offered for sale the invention of the patent in suit, as required by 35 U.S.C. §282.

THIRD AFFIRMATIVE DEFENSE

16. Defendants have not infringed any valid claim of Patent No. 3,252,149.

WHEREFORE, defendants pray that the Court render judgment dismissing the complaint, awarding to defendants their costs and expenses and reasonable attorneys fees incurred in connection with the action, and granting such other and further relief as to the Court may seem just and proper.

LORENZ, FINN, GIARDINO & LAMBOS
Attorneys for Defendants Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd.

April 10, 1973

By James A. Flynn / RD
James A. Flynn, Esq.
21 West Street
New York, New York 10006

Of Counsel:
Robert E. Isner, Esq.
HIMS, HOWES, COLLISON & ISNER
60 E. 42nd Street
New York, N. Y. 10017

A18

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, Plaintiff, -v- THE NEW YORK RACING ASSOCIATION, INC., AND AUTOMATIC TOTALISATORS (U.S.A.) LTD., Defendants.	AMENDED ANSWER OF DEFENDANT, AUTOMATIC TOTALISATORS (U.S.A.)LTD. TO THE AMENDED AND SUPPLEMENTAL COMPLAINT

COMES NOW defendant, Automatic Totalisators (U.S.A) Ltd., and answers, by its attorneys and pursuant to the order of the Honorable Max Schiffman dated March 21, 1973, the amended and supplemental complaint of Digitronics Corporation, the numbered paragraphs herein corresponding to the similarly numbered paragraphs in the amended and supplemental complaint, as follows:

1. Admits the allegation of paragraph 1 of the amended and supplemental complaint.

2. Admits, on information and belief, the allegations of paragraph 2 of the amended and supplemental complaint, except denies, on information and belief, that defendant The New York Racing Association, Inc. has committed any act of infringement within the Eastern District of New York, or elsewhere.

3. Admits the allegations of paragraph 3 of the amended and supplemental complaint, except denies that Automatic Totalisators (U.S.A.) Ltd. has a regular and established place of business in the Eastern District of New York and denies that it has committed any act of infringement within the Eastern District of New York, or elsewhere.

4. Admits, on information and belief, the allegations of paragraph 4 of the amended and supplemental complaint, except denies, on information and belief, that Automatic Totalisators Ltd. has a regular and established place of business in the Eastern District of New York and denies, on information and belief, that it has committed acts of infringement there or elsewhere.

5. Admits, on information and belief, the allegations of paragraph 5 of the amended and supplemental complaint, except denies, on information and belief, that Premier Equipment Proprietary Ltd. has committed any acts of infringement.

6. Admits that the amended and supplemental complaint purports to allege a claim under the Patent Laws of the United States for infringement of United States Letters Patent.

7. Admits that United States Patent No. 3,252,149 entitled "Data Processing Systems" was issued on May 17, 1966, to

Digitronics Corporation of Albertson, New York, a corporation of the State of Delaware, as the assignee of Robert L. Weida, Edward M. Richards, Evelyn Berezin, Jack Knoll and Philip Rosenblatt, but denies that said patent was duly and legally issued, that said patent was for an invention, that any invention is described or claimed therein or that any of the said named individuals are inventors or have made any inventions. Defendant is without sufficient knowledge to form a belief as to whether the plaintiff still is the owner of said patent and therefore denies the same.

8. Admits that Automatic Totalisators (U.S.A.) Ltd. engages in the sale and servicing of Data Processing Systems, admits, on information and belief, that Automatic Totalisators Ltd. engages in the sale of Data Processing Systems, and denies each and every other allegation of paragraph 8 of the amended and supplemental complaint.

9. Admits the allegations of paragraph 9 of the amended and supplemental complaint.

10. Denies each and every allegation of paragraph 10 of the amended and supplemental complaint.

11. Admits that prior to the service and filing of the amended and supplemental complaint plaintiff had notified

Defendant Automatic Totalisators (U.S.A.) Ltd., that it claimed that it was in infringement of letters patent No. 3,252,149, admits, on information and belief that such notice had been given to the New York Racing Association, and denies, on information and belief, every other allegation of paragraph 11 of the amended and supplemental complaint.

12. Denies each and every allegation of paragraph 12 of the amended and supplemental complaint.

FIRST AFFIRMATIVE DEFENSE

13. On information and belief, Patent No. 3,252,149 is invalid in that:

(a) The alleged information thereof was known or used by others in this country or patented or described in a printed publication in this or in a foreign country before the invention thereof by the applicants for the said patent.

(b) The alleged invention thereof was patented or described in a printed publication in this or in a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for the patent in the United States.

(c) The applicants for the patent did not themselves invent the subject matter sought to be patented thereby.

(d) The differences between the subject matter sought to be patented in the patent and the prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which the subject matter of the said patent pertains.

(e) Before the earliest date upon which the applicants for said patent are entitled to rely as the date of their alleged invention, the alleged invention sought to be patented therein was, in all material and substantial respects, made in this country by others who had not abandoned, suppressed or concealed it.

(f) The description of the alleged invention, and the manner and process of making and using it, in the specification is not in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make, construct, practice, or use the same.

(g) The claims of the patent do not particularly point out and distincly claim the subject matter of the alleged invention..

(h) By reason of the proceedings in the United States Patent Office during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the admissions and representations therein made by and on behalf of the applicants in order to induce the grant of said patent, plaintiff is estopped to claim for United States Letters Patent No. 3,252,149 a construction, were the same otherwise possible (which is denied), such as would cause said patent to cover or include any act of defendant of which plaintiff has complained.

(i) By reason of the proceedings in the United States Patent Office in conjunction with and during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the nature, scope and extent of the representations and other actions taken or made by or on behalf of the applicants therein in order to induce the grant of said patent, the Commissioner of Patents was induced to mistakenly issue the United States Letters Patent No. 3,252,149 and that said Letters Patent is unenforceable by the plaintiff herein.

(j) That, upon information and belief, in an attempt to secure a coercive position of exclusivity in the field of electronic totalizators for parimutuel betting

operations, plaintiff filed application Serial No. 268,743 for the patent in suit on March 28, 1963 improperly seeking claims directed to dominate current activities in the electronic totalizators parimutuel betting field which incorporated developments and contributions of others than the named inventors thereof. On information and belief, in furtherance thereof, and during the proceedings in the United States Patent Office in conjunction with and during the prosecution of the said application which resulted in the issuance of United States Letters Patent No. 3,252,149, the applicants failed to fulfill their duty to bring to the attention of the Patent Office, and wilfully withheld therefrom, relevant prior art known to the applicants or their attorneys or which should have been so known through the exercise of reasonable care and diligence, including the existence of a prototype electronic totalizator made and sold by plaintiff to Westbury Electronic Corp. and publicly operated and demonstrated before March 28, 1962; the existence of a printed publication of Westbury Electronic Corp. before March 28, 1962 that described and disclosed the subject matter of the patent in suit and of U.S. Patent No. 2,479,681. On information and belief, such actions constituted misrepresentation in the nature of willful and knowing breach of applicant's duty to inform the Patent Office of material facts with the intent to induce

the issuance of the patent in suit and the Commissioner of Patents was induced to mistakenly issue such United States Letters Patent No. 3,252,149 and that said Letters Patent is unenforceable by the plaintiffs herein.

14. Defendant will give notice, in writing, to plaintiff at least thirty (30) days before trial, of the country, number, date, and name of the patentee of any patent, the title, date and page numbers of any publication to be relied upon as anticipation of the patent in suit or as showing the state of the art, and the name and address of any person who may be relied upon as the prior inventor or as having prior knowledge of or as having previously used or offered for sale the invention of the patent in suit, as requred by 35 U.S.C. § 282.

SECOND AFFIRMATIVE DEFENSE

15. Defendant has not infringed any valid claim of Patent No. 3,252,149.

WHEREFOR, defendant prays that the Court render judgment dismissing the complaint, awarding the defendant its costs and expenses and reasonable attorneys fees incurred in connection with the action, and granting such other and further relief as to the Court may seem just and proper.

CAHILL, GORDON, SONNETT, REINDEL & OHL
Attorneys for Defendant Automatic Totalisators (U.S.A.) Ltd.

April 10, 1973

By Raymond L. Falls, Jr./RB
Raymond L. Falls, Jr.
80 Pine Street
New York, New York 10005

Of Counsel:

Robert E. Isner
NIMS, HOWES, COLLISON & ISNER
60 East 42nd Street
New York, New York 10017

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, Plaintiff, -v- THE NEW YORK RACING ASSOCIATION, INC., and AUTOMATIC TOTALISATORS (U.S.A.) LTD., Defendants.	AMENDED ANSWER OF DEFENDANT, THE NEW YORK RACING ASSOCIATION, INC. to THE AMENDED AND SUPPLEMENTAL COMPLAINT.

COMES NOW defendant, The New York Racing Association, Inc., and answers, by its attorneys and pursuant to the order of the Honorable Max Schiffman dated March 21, 1973, the amended and supplemental complaint of Digitronics Corporation, the numbered paragraphs herein corresponding to the similarly numbered paragraphs in the amended and supplemental complaint, as follows:

1. Admits the allegation of paragraph 1 of the amended and supplemental complaint.

2. Admits the allegations of paragraph 2 of the amended and supplemental complaint, except denies that defendant The New York Racing Association, Inc. has committed any act of infringement within the Eastern District of New York, or elsewhere.

3. Admits on information and belief the allegations of paragraph 3 of the amended and supplemental complaint, except

denies on information and belief that Automatic Totalisators (U.S.A.) Ltd. has a regular and established place of business in the Eastern District of New York and denies on information and belief that it has committed any act of infringement within the Eastern District of New York, or elsewhere.

4. Admits, on information and belief, the allegations of paragraph 4 of the amended and supplemental complaint except denies, on information and belief, that Automatic Totalisators Ltd. has a regular and established place of business in the Eastern District of New York and denies, on information and belief, that it has committed acts of infringement there or elsewhere.

5. Admits, on information and belief, the allegations of paragraph 5 of the amended and supplemental complaint except denies, on information and belief, that Premier Equipment Proprietary Ltd. has committed any acts of infringement.

6. Admits that the amended and supplemental complaint purports to allege a claim under the Patent Laws of the United States for infringement of United States Letters Patent.

7. Admits that United States Patent No. 3,252,149 entitled "Data Processing System" was issued on May 17, 1966, to Digitronics Corporation of Albertson, New York, a corporation of the State of Delaware, as the assignee of Robert L. Weida, Edward M. Richards, Evelyn Berezin, Jack Knoll and Philip Rosenblatt, but denies that said patent was duly and legally issued, that said patent was for an invention, that any invention

is described or claimed therein or that any of the said named individuals are inventors or have made any inventions. Defendant is without sufficient knowledge to form a belief as to whether the plaintiff still is the owner of said patent and therefore denies the same.

8. Admits on information and belief that Automatic Totalisators Ltd. and Automatic Totalisators (U.S.A.) Ltd. engage in the sale and servicing of Data Processing Systems and denies each and every other allegation of paragraph 8 of the amended and supplemental complaint.

9. Admits the allegations of paragraph 9 of the amended and supplemental complaint.

10. Denies each and every allegation of paragraph 10 of the amended and supplemental complaint.

11. Admits that prior to the service and filing of the amended and supplemental complaint plaintiff had notified defendant The New York Racing Association that it claimed that it was in infringement of letters patent No. 3,252,149, admits, on information and belief that such notice had been given to Automatic Totalisators (U.S.A.) Ltd., and denies, on information and belief, every other allegation of paragraph 11 of the amended and supplemental complaint.

12. Denies each and every allegation of paragraph 12 of the amended and supplemental complaint.

FIRST AFFIRMATIVE DEFENSE

13. On information and belief, Patent No. 3,252,149 is invalid in that:

(a) The alleged invention thereof was known or used by others in this country or patented or described in a printed publication in this or in a foreign country before the invention thereof by the applicants for the said patent.

(b) The alleged invention thereof was patented or described in a printed publication in this or in a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for the patent in the United States.

(c) The applicants for the patent did not themselves invent the subject matter sought to be patented thereby.

(d) The differences between the subject matter sought to be patented in the patent and prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which the subject matter of the said patent pertains.

(e) Before the earliest date upon which the applicants for said patent are entitled to rely as the date of their alleged invention, the alleged invention sought to be patented therein was, in all material and substantial respects, made in this country by others who had not abandoned, suppressed or concealed it.

(f) The description of the alleged invention, and the manner and process of making and using it, in the specification is not in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make, construct, practice, or use the same.

(g) The claims of the patent do not particularly point out and distinctly claim the subject matter of the alleged invention.

(h) By reason of the proceedings in the United States Patent Office during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the admissions and representations therein made by and on behalf of the applicants in order to induce the grant of said patent, plaintiff is estopped to claim for United States Letters Patent No. 3,252,149 a construction, were the same otherwise possible (which is denied), such as would cause said patent to cover or include any act of defendant of which plaintiff has complained.

(i) By reason of the proceedings in the United States Patent Office in conjunction with and during the prosecution of the application which resulted in United States Letters Patent No. 3,252,149 and the nature, scope and extent of the representations and other actions taken or made by or on behalf of the applicants therein in order to induce the grant of said patent, the Commissioner of Patents was induced to mistakenly issue the United States Letters Patent No. 3,252,149 and that said Letters Patent is enenforceable by the plaintiff herein.

(j) That, upon information and belief, in an attempt to secure a coercive position of exclusivity in the field of electronic totalizators for parimutuel betting operations, plaintiff filed application Serial No. 268,743 for the patent in suit on March 28, 1963 improperly seeking claims directed to dominate current activities in the electronic totalizator parimutuel betting field which incorporated developments and contributions of others than the named inventors thereof. On information and belief, in furtherance thereof, and during the proceedings in the United States Patent Office in conjunction with and during the prosecution of the said application which resulted in the issuance of the United States Letters Patent No. 3,252,149, the applicants failed to fulfill their duty to bring to the attention of the Patent Office,

and wilfully withheld therefrom, relevant prior art known to the applicants or their attorneys or which should have been so known through the exercise of reasonable care and diligence, including the existence of a prototype electronic totalizator made and sold by plaintiff to Westbury Electronic Corp. and publicly operated and demostrated before March 28, 1962; the existence of a printed publication of Westbury Electronic Corp. before March 28, 1962 that described and disclosed the subject matter of the patent in suit and of U.S. Patent No. 2,479,681. On information and belief, such actions constituted misrepresentation in the nature of willful and knowing breach of applicant's duty to inform the Patent Office of material facts with the intent to induce the issuance of the patent in suit and the Commissioner of Patents was induced to mistakenly issue such United States Letters Patent No. 3,252,149 and that said Letters Patent is unenforceable by the plaintiff herein.

14. Defendant will give notice, in writing, to plaintiff at least thirty (30) days before trial, of the country, number, date, and name of the patentee of any patent, the title, date and page numbers of any publication to be relied upon as anticipation of the patent in suit or as showing the state of the art, and the name and address of any person who may be

relied upon as the prior inventor or as having prior knowledge of or as having previously used or offered for sale the invention of the patent in suit, as required by 35 U.S.C. § 282.

SECOND AFFIRMATIVE DEFENSE

15. Defendant has not infringed any valid claim of Patent No. 3,252,149.

WHEREFORE, defendant prays that the Court render judgment dismissing the complaint, awarding to defendant its costs and expenses and reasonable attorneys fees incurred in connection with the action, and granting such other and further relief as to the Court may seem just and proper.

CAHILL, GORDON, SONNETT, REINDEL & OHL
Attorneys for Defendant, The New York Racing Association, Inc.

By Raymond L. Falls Jr.
Raymond L. Falls, Jr.
80 Pine Street
New York, New York 10005

April 10, 1973

Of Counsel:
Robert E. Isner
NIMS, HOWES, COLLISON & ISNER
60 East 42nd Street
New York, New York 10017

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, now AMPEREX ELECTRONIC CORPORATION,

Plaintiff,

v.

THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.,

Defendants.

Index No. 67
Civil 1119

PLAINTIFF'S REPLY TO SECOND COUNTERCLAIMS FILED BY AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.

Plaintiff, for reply to the Second Counterclaim set forth in section [A], paragraphs 20-26 inclusive of defendant Automatic Totalisators (U.S.A.) Ltd., says:

20. Plaintiff admits the jurisdictional allegations of paragraph 20 but denies that plaintiff has engaged in any activities in violation of the enumerated statutes or in any unlawful activities.

21. Plaintiff admits the allegations of paragraph 21.

22. Plaintiff admits the allegations of paragraph 22.

23. Plaintiff admits the allegations of paragraph 23, except that plaintiff is without knowledge or information sufficient to form a belief as to the truth of the allegation regarding commerce with foreign countries.

24. Plaintiff denies each and every allegation of paragraph 24.

25. Plaintiff admits: the filing of a United States Patent

Application Serial No. 268743 on March 28, 1963 for DATA PROCESSING SYSTEM and prosecution thereof to issuance as United States Patent No. 3,252,149 on May 17, 1966 (paragraph 25(a)); the existence of a demonstrator electronic totalisator made by plaintiff (paragraph 25(c)(i)); the existence of a printed brochure bearing the title "All-Electronic Totalizator" (paragraph 25(c)(ii)); knowledge of United States Patent No. 3,255,692 (paragraph 25(c)(iv)); the filing of patent applications corresponding to said United States patent application Serial No. 268743 in Italy, France, West Germany, Great Britain and Canada (paragraph 25(d)); and the allegations of paragraph 25(e), but denies each and every remaining allegation set forth in paragraph 25 including all subparagraphs thereunder.

26. Plaintiff denies each and every allegation of paragraph 26 including all subparagraphs thereunder.

WHEREFORE, plaintiff denies that defendant Automatic Totalisators (U.S.A.) Ltd. is entitled to the relief prayed for in its Second Counterclaim, or to any relief, and prays that the counterclaim be dismissed with costs and attorney fees to plaintiff, and for such other and further relief as the Court may deem just and equitable.

Plaintiff, for reply to the Second Counterclaim set forth in section [B], paragraphs 21-27 inclusive of each of defendants Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd., says:

21. Plaintiff admits the jurisdictional allegations of paragraph 21 but denies that plaintiff has engaged in any activities in violation of the enumerated statutes or in any unlawful activities.

22. Plaintiff admits the allegations of paragraph 22.

23. Plaintiff admits the allegations of paragraph 23.

24. Plaintiff admits the allegations of paragraph 24, except that plaintiff is without knowledge or information sufficient to form a belief as to the truth of the allegation regarding commerce with foreign countries.

25. Plaintiff denies each and every allegation of paragraph 25.

26. Plaintiff admits: the filing of a United States Patent Application Serial No. 268743 on March 28, 1963 for DATA PROCESSING SYSTEM and prosecution thereof to issuance as United States Patent No. 3,252,149 on May 17, 1966 (paragraph 26(a)); the existence of a demonstrator electronic totalisator made by plaintiff (paragraph 26(c)(i)); the existence of a printed brochure bearing the title "All Electronic Totalizator" (paragraph 26(c)(ii)); knowledge of United States Patent No. 3,255,692 (paragraph 26(c)(iv)); the filing of patent applications corresponding to said United States patent application Serial No. 268743 in Italy, France, West Germany, Great Britain and Canada (paragraph 26(d)); and the allegations of paragraph 26(e), but denies each and every remaining allegation set forth in paragraph 26 including all subparagraphs thereunder.

27. Plaintiff denies each and every allegation of paragraph 27 including all subparagraphs thereunder.

WHEREFORE, plaintiff denies that each of the defendants Automatic Totalisators Ltd. and Premier Equipment Proprietary Ltd. is entitled to the relief prayed for in their Second Counterclaim, or to any relief, and prays that each of their counterclaims be dismissed with costs and attorney fees to plaintiff, and for such other and further relief as the Court may deem just and equitable.

S. C. Yuter
605 Third Avenue
New York, N.Y. 10016
(212) 986-1221

Attorney for Plaintiff

Dated: New York, N.Y.
July 8, 1974

Of Counsel:

Daniel M. Rosen
Russell G. Pelton

CERTIFICATE OF SERVICE

This is to certify that two copies of the foregoing PLAINTIFF'S REPLY TO SECOND COUNTERCLAIMS ... were served by first class mail, postage prepaid, to Robert E. Isner, Esq., Counsel for Defendants, at Nims, Howes, Collison & Isner, 60 East 42nd Street, New York, N.Y. 10017, this 8th day of July, 1974.

S. C. Yuter
Attorney for Plaintiff

FILED
IN CLERK'S OFFICE
U.S. DISTRICT COURT E.D. N.Y.
SEP 16 1975
TIME A.M.
P.M.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, NOW AMZEREX ELECTRONIC CORPORATION,

Plaintiff,

-against-

67 C 1119

THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.,

Defendants.

MEMORANDUM and ORDER

Appearances:

S.C. YUTER, Esq., (Messrs. YUTER & ROSEN, of Counsel) for plaintiff

ROBERT E. ISNER, Esq. (Messrs. NIMS, HOWES, COLLISON & ISNER, of Counsel) for Defendants

DOOLING, D. J.

The trial of this action based on alleged infringements of Weida patent No. 3,252,149 has been long. The specification of the patent is not easy to read, the figures are not communicative, and the field of the patent at first blush appears complex. But the lengthy trial and the discursive manner of presentation have put in very nearly the whole background against which the patent can

BEST COPY AVAILABLE

be evaluated. Now in suit are claims 20 through 27 of the 33 claims of the patent and the question of infringement, oddly, becomes very largely a question of the true nature, genuine scope and ultimate validity of the claims. If the devices accused do not infringe, it can only be because the claims, for all the seeming breadth of such claims as claim 20, must be narrowly read. The points of difference upon which non-infringement turns appear trivial unless the claims involved are so very narrowly read that practical effect escapes them; yet contracting them into an area of validity destroys their claim to unobviousness.

Nominally the patent is for improvements in a data processing system and particularly in systems for processing data received from ticket issuing machines. The patent application was largely drawn from a set of totalisator components and their linkage designed for installation at the raceway at Westbury, Roosevelt Raceway, or the raceway at Monticello, or both. It is suggested, therefore, that the patent should be reviewed against the background of the totalisator art (Class 235-92), and that, so viewed, the argument for the validity of the present patent includes credit for extending to the

totalisator field the art of the data processing field, and that the standard man of ordinary skill put up by Section 103 must therefore be the men who were and had for years been working on totalisators and in the totalisator field rather than those men who had the skills ordinary in the data processing field. Regrettably, that cannot be the case. The patent was granted as a patent on a data processing system in Class 340-172.5; it was a patent of a company which evidently worked exclusively in the electronic data processing field, and the patentees were men and women working in that field, and, in the years here in question, very naturally working in the newest branch of it, the solid state electronic data processing arts, invoking the use of transistors and other semiconductors.

I

The genesis of the patent was in the work that Digitronics undertook with and for the Roosevelt Raceway trotting track. The first contact of Digitronics with Raceway people was in the first part of 1959, and at a fairly early date Digitronics was, after receiving a description of the parimutuel betting system then used at the raceway, prepared to and did propose a reasonably

detailed specification for an essentially solid state electronic system covering the functions of a parimutuel system. The preliminary proposal presented to Roosevelt Raceways under date of May 11, 1959 (Exhibit F) helps to outline the requirements of a parimutuel system at a working racetrack, and at the same time the scope of the system which Digitronics was proposing at this relatively early date. It should however be noticed that a year earlier (Ex.74) Roosevelt Raceway had raised with American Totalisator Company (Amtote) the possibility of using "electronic computing machines and techniques now available"to increase betting time and expedite delivery of pay-off information in daily-double betting. Although the Digitronics 1959 proposal presupposed the use in the main of solid state circuitry, the proposal to use electronics in a totalisator system was at least a decade old. That is made clear from the Moerman patent, applied for in January 1948 and issued in June 1949 (No.2,472,542); Moerman proposed the use of vacuum tubes and thyatrons; the system of his patent is far from a complete system; moreover, apparently some kind of experimental installation was unsuccessfully tried out with Amtote participation at the

Raceway in 1947 (Ex. 70). And there were patent application filings for electronic (vacuum tube) totalisators in 1945 (No. 2,557,384, Amtote; partially electronic), in 1949 (No. 2,652,977, Amtote; partially electronic; analog odds computer subsystem), in 1952 (No. 2,837,281, totalisator equipment;some solid state diodes, evidently used as rectifiers), and in 1954 (No. 2,987,250; electronic totalisator). The Digitronics 1959 proposal outlined the function of the equipment as, One, to issue betting tickets at each of the windows (through ticket issuing machines, referred to throughout as TIMs) on which would be printed out at the moment of issuance at least the number of the horse, the date the ticket issued,and the race for which the ticket was issued; Two, to gather the betting data continuously from up to 300 windows for each of 9 races and from each of up to 150 daily double windows, the TIMs to be adaptable to be assigned to win or place or show bets in any denomination by means of interchangeable plug boards; Three, to total all the bets on a race for up to a stated maximum number of horses entered in separate pools for win, place and show, to subtract the state's

and club's share of each pool, compute the win, etc. odds for each entry in the race, to compute the pay off for win and place and show at the end of each race, to show the totals bet at each TIM for each race, to show the daily double net pool, to compute the payoffs for every combination of first and second race winners rounded off at $0.10, to adjust the pool and odds data in the case of late scratches, and to make provision for computations in the event of ties of up to three-horse ties; Four, to display on a tote board every 70 seconds the totals bet in each race on each horse for each of win, place and show finishes, the tentative odds on each horse and the daily double net pool; after every race to display within five seconds of the judge's decision the exact payoffs and at the end of the first race, the possible daily double payoffs on each horse in the second race; and, Five to display at the central monitoring station and/or calculating room all the information covered in the computations in Three above.

Pages 2 through 5 of the preliminary proposal, Exhibit F, outline the components of the system visualized

by the proposal; they may be compared with the greatly simplified block diagrams, Exhibits BL, BS and BT and the more specific and detailed block diagrams of the accused devices as shown in Exhibits 49 and 61, and the device of the patent as portrayed in its Figures, and especially as outlined in heavy ink in Exhibits 14 through 16A.

The system as proposed [illegible] was visualized as comprising TIMs, the data collection system, the computer and the display components. First, the ticket dispensers or ticket issuing machines - the TIMs; these would incorporate ticket rolls and a printing mechanism for imprinting the bet data on each ticket as issued. The TIMs were to be provided with interlocks to prevent erroneous or duplicative reporting of an operation, and each TIM was to have a counter to accumulate total transactions, which could be checked against the central data collection system. Second, the data collection system was to embrace interrogation of each TIM sequentially ten times a second, each TIM to respond with a standby sign if it had no transaction or with a transaction signal (when a ticket sale was occurring) which would indicate the number of the

horse on which the bet was being placed, and each betting datum would be registered in "memory;" it was, further, to embrace wiring connecting each TIM to the central data collection system to carry the information elicited from each TIM as it was interrogated in turn and to convey a signal from the central station in effect to unlock the TIM to enable it to operate only if the system and signals were in order. The central unit of the data collection system was to be the data accumulator, which was to have four principal parts, the scanner, the plugboard, the "interpreter," and the "memory," connected by appropriate miscellaneous circuitry. The scanner was continuously to send out in sequence various code combinations to interrogate the TIMs in such manner that the information collected identified the originating TIM. The scanner was to make a complete circuit of all the TIMs in one-tenth of a second. The plugboard was to make it possible to set up any of the 300 regular TIMs for win, place or show bets in any denomination. The interpreter was both to store in the "memory" data received from the TIM response wires and the plugboard and also to indicate any failure of these signals to conform

FPI—SS—3-17-72—30M—8150

to the rigid criteria of correct operation. Interpreter control of the "memory" was to provide signals to indicate when the TIM was locked because engaged in a sale, or because betting was closed for the race so that nothing would be added by error to the "memory," and a combination of signals to report to the memory a ticket sold on a particular horse, and for a particular finish position and in a particular bet denomination, the latter two elements being derived from the plugboard classification of the TIM. Once the bet had been registered in the memory, (or on receiving a standby signal from a TIM that had no transaction), the interpreter was to signal the TIM to "unlock." If such a signal did not follow immediately upon the scan cycle, the TIM was to "lock up." The "unlock" signal was to indicate registration of the bet (or simply to act as an added check in the case of the TIM with no transaction). The interpreter was also to make several types of checks against malfunction or erroneous betting.

The fourth element in the data accumulator was to be the memory whose function was to store information required for computations and for print-out or visual display. One section of the memory was to store the total wagers on each horse entered in the race in the appropriate win or place or show

FPI—38—3-17-72--30M—9153

pool. A second section of the memory was to store the total for each TIM using the same dollar figures that were added to make up the pool totals for each horse. A detailed print-out of the TIM was to be automatically available.

The fourth major component comprised in the totalisator system proposed was the computer. It was to compute and recompute the odds at the completion of each scan of the TIMs and store the odds data for posting at frequent intervals. At the end of the race the pay off was to be computed and available for posting within five seconds. The computer memory was to store the data needed for pay off results as well as other constants required to determine the odds.

The fifth major component comprised in the totalisator system was to be the display equipment. It was to exhibit the amounts bet on each horse for win, place and show, the total win, place and show pools, and the odds. The display material was to be brought up to date every 70 seconds. A local display panel was to be provided for monitoring the data before it was fed to the main display board (usually in the infield). After each race the payoffs

FPI—SS—3-17-72—3000—9153

were to be displayed as soon as they had been computed and monitored.

Discussions between Digitronics and Roosevelt Raceway continued over a protracted period and by November of 1959 the parties were talking in terms of first building a prototype or "simulator" on a small scale to demonstrate how the actual system of ticket dispensing, computation and display would function for both daily double and regular operations. A sort of specification was then prepared (Ex.94-A) and later incorporated in Ex.AP but it dealt essentially in what the prototype would do and show and how it would differ from the production model that was also in contemplation, and it did not give any specification of its components and system. However, enough appears from it to indicate that it was at least roughly compatible with the May 11, 1959, outline of the preliminary proposal so far as the system envisioned was concerned.

The outline for the demonstrator was included as the first of the exhibits or appendices annexed to the agreement (Ex.AP) ultimately made between Westbury Electronics Corp. and Digitronics which was under discussion

from December 1959 and which was in form dated January 31, 1961 but which in fact was signed somewhat later, and after the failure of a protracted effort to secure the participation in the venture of Yonkers Raceway, Inc., "Exhibit B," (Ex.94B), incorporated in that agreement (Exhibit AP), was apparently prepared in February of 1960. Exhibit 94B visualized a 470 TIM installation about a quarter of which would be daily double TIMs. Exhibit 94B visualized a plan which would provide for a scan of each TIM four time per second. A scan sequence in terms of win, place and show by denominations was assumed, and it was planned that each TIM should be scanned even if locked and unused, the effect of such a scan being a zero accumulation. The scanner was to feed its information into the central unit. The central memory for accumulating information was to be of two units, one to be called the "window" memory, which would accumulate the total transactions for each horse at each window, providing information to an individual high-speed printer. The second unit of the memory was the parimutuel memory which was to accumulate the betting data for each of the win, place and show pools for each of the horses (Ex.94B, Figure 3-A). In the central unit both parimutuel calculation

FPI—SS—3-17-72—3014—9153

components would be duplicated, each computation would be done twice, and the results would be compared with a previous computation on that machine as well as the computation on the duplicate machine. In addition the data would be checked into and out of the memory. The operator of the entire machine by operating an appropriate control on the central panel could bypass any defective section of the dual machine for repair while the rest continued to operate. The "window" memory (i.e., TIM memory) would serve as an additional spare, since the amounts bet could be calculated, if need were, from the individual TIM accumulation of transactions for each post-position in each race by the betting denomination and finish-classification of that TIM. "Exhibit B" annexed to Exhibit AP (i.e., Ex. 94-B) visualized that the basic unit for the entire machine would be the "timer unit," which was to "enable" data into and out of the memory, and cause the selectio of the appropriate window machine for interrogation during the TIM scan; during the computation the timer would arrange for a different sequence of accesses to the memory, as required by the computational procedure. In the system of Ex. 94-B during a scan, as a TIM is examined, the selected horse number will include a check signal which the central

unit would examine; if satisfactory, and if the resultant computation in the central unit is satisfactory, a "confirm" signal would be sent back to the TIM. Receipt of that "confirm" signal would permit the TIM to issue the betting ticket. Absent a "confirm" signal the TIM would lock up - a result that either mechanical defect or/the "scratching" of a horse could precipitate.

Under the proposed system "memory" would be of the "coincident current magnetic core type." The memory arrangement would accomodate a total of 12 bits (that is a magnetic imprint on a tiny annulus), eleven to be used for data and one as a parity check. Each time a total came from the memory it was to be checked for an odd number of bits as well as for identity with the quantity being read out of the duplicate memory. Once every 70 seconds during the constant scanning of the memory an odds computation would be performed. The bets were to be translated into dollars as the computation occurred. Since the TIMs would be identified and their denomination and win, place or show classification known, the raw storage element would be the number of bets at each TIM, but in the memory they would be grouped by their classes and as so accumulated multiplied

by their appropriate dollar amounts to give the total of the pool for each finishing position.

At the end of the betting the output of the TIM memory was to control a high speed printer. This was to print-out the number of wagers at each TIM on each of the maximum of 10 horses that can be entered in a race at Roosevelt Raceway. Calculating room and infield displays were to be provided in considerable detail.

The part of Exhibit 94B (page 7, et seq.), dealing with the operation of the system, gives a clearer idea of the circuitry and its relation to the demonstrator. To initiate the betting, an operator at the central control must press the "start bet" control button and, by so doing, allow the issuance of tickets by the TIMs. Depressing the start bet control button clears the memory and initiates the scanning of all the TIMs. (This is the initial clear signal (ICL) of the patent, which originates at the console as shown in plaintiff's Exhibit 4 which combines Figures 1A and 1B of the patent). Probable odds and money totals are displayed and the operation continues until the end-bet control button is pushed. Whenever a horse is scratched, the operator depresses the "scratch" button for that horse number, and that prevents

any TIM from issuing a ticket on the scratched horse. (This is indicated in Exhibit 4 at the console in the series of SKW keys or levers which are numbered from 1 to N.) At each TIM at the end of the race, a printout of the individual horse transactions at that TIM is effected. When the winner has been determined, the control operator can press the Win button and the button for the appropriate horse (or - in the case of a dead heat - horses) and the "calculate" button; the result is to display in the calculating room the payoff on the winning horses. Similarly, the calculation and display are made for the show and place horses. A complete breakdown of the central system is backed up by the accessibility of the individual paper tapes of all transactions kept at each TIM as the wagers are made. These are fed into an off-line window totalizer which is in effect a high speed paper tape reader and an accumulation facility.

Under the "physical description" portion of Exhibit 94B, the presentation explains that electronic data gathering, calculation and control units, as well as the display and printout units, will be at the central location, and that

FPI—SS—3-17-72—30M—9153

the electronic memory and calculation circuits would be housed in ten racks, one of the racks including the plugboard, which could be arranged to determine the wager denomination and nature (as between win, place and show) of the TIMs. Scanning is to be by a central electronic scanning unit, and a control console would give the operator control of the displays and printouts; the console would include switches, buttons and associated indicators arranged for convenient operation. In addition, there are to be at the central control location (as noted above) a high speed 48 column printer to provide the printouts, earlier described; the printer would operate at 600 lines per minute; a pair of lister type printers would provide a 10 column, 3 line per second printout. These listers could also function as standby equipment for the high speed printer above described. There would also be included a perforated-tape reader to read the tape and cause the printout on the listers during off-line totalizing.

The presentation describes also, at page 14, the types of errors that the system would be able to detect and make provision against. It notes that two processes occur

simultaneously as the system operates: first, accumulation of the number of bets at each betting denomination for each horse and in each of the win, place or show pools and, second, the accumulation of the number of bets for each horse at each TIM (the MEMA and WM of the patent). It describes a four way check on the first process consisting in performance of the process by two computing sections, each of which checks both against itself and against the other. The second process is subject to only a two way check since it does each operation twice and thus checks against itself. The first process is used to determine the parimutuel betting operation and cannot permit error or down time. Transient error is to be instantly detected and signalled to the operator, but the machine must automatically select the section which is providing the correct answer and establish the correct answer in both of the duplicating sections. Hence, a transient error, it is provided, might be detected and corrected by the computer and thus be classed as a detected and corrected error. If in the first of the two processes one side fails to operate at all, it would report "error" to the operator and could be taken out of action by operator intervention. Such an event is

described as an "outage" error. During such an outage the parimutuel section will be operating essentially on the same basis as the TIM sections, that is, it will do each calculation twice and check the second result against the first. Any detected error is reported in detail to the operator while the TIM scanning process continues. Detected and reported errors take the shape of printouts on the lister of the TIM and horse number involved in the error. Since an error transaction is never entered in the totalizing memory, a TIM with a defective machine can continually report defective data which will not be acceptable to the computer, and such a window will be automatically locked up at each scan regardless of the ticket seller's efforts. This type of error would be classed as a "window-lockup" error.

Exhibit AP was not actually signed until over a year after its Exhibits A and B (Exhibits 94A and 94B respectively in the present suit) were prepared. Meanwhile there was a protracted effort to bring Yonkers Raceway into the transaction and a good deal of discussion within Roosevelt Raceway's organization about how to handle the Amtote situation. The Raceway contract with Amtote was to expire at the end of the

1960 racing season, and Roosevelt Raceway was anxious to change that relation materially. At the same time that Roosevelt was considering trying to work out radical changes in its relation with Amtote, it was exploring the possibility of an arrangement with Western Totalizator Company, apparently a subsidiary of American Dryer Corporation and identified with Joseph Lease as its principal negotiator and perhaps a principal in the firm. At the same time, negotiations with Digitronics were pushed along in the general framework of spending something like $100,000 for a prototype to be followed by a complete installation at a cost approximating $1,100,000. Roosevelt Raceway's ideas embraced, as the draft agreement indicates, a visualization that it would itself get into the totalizator providing business. Digitronics was not unaware that it was at least possible that Roosevelt Raceway was simply playing it off against Amtote, and Digitronics prepared itself in some circumstances to see whether it could not form some kind of alliance or other with Amtote, providing Amtote with electronic know-how for the modernization of its equipment and taking advantage of Amtote's position and experience as well as its specific

skills and of Amtote's access to the Bell-Punch TIMs, the TIMs successfully used by Amtote in its electromechanical installations. By late March 1960, Digitronics was becoming convinced that Roosevelt Raceway might well decide on the prototype at least, and near the end of March, 1960 Roosevelt Raceway had an experienced man in effect go over the Digitronics materials. His report approved the Exhibit 94B proposal as satisfactory for acceptance but he had criticisms of details, particularly with respect to error frequency. On March 31, 1960 the executive committee of Roosevelt Raceway was told that an investigation of Digitronics installations at Bache & Co., Merrill Lynch, Pierce, Fenner & Smith and other brokerage firms had been made and that the installations were said to operate to complete satisfaction. It was also reported that the electrical engineer who had been hired to check up on Digitronics had discussed with Digitronics engineers "the method and system which they intend to initiate in the manufacture of the machines to be designed and offered," that he had checked on their ability to produce and their time table for completing the prototype, and that apparently

he had found nothing wrong with them; it was reported to the executive committee that the retained expert had explained the "tremendous advantages" of electronic computation, and expressed his belief that an electronic installation was capable of much greater reliability than an electrical installation. It was thought that the equipment could be installed at Roosevelt Raceway for a sum not to exceed $1,200,000, independent of the prototype, which was not to exceed $100,000 in cost; the executive committee recognized that the Investment would be depreciable for tax purposes and would, in addition, eliminate the cost for commission and rental incurred with Amtote which amounted to $473,000 for 1959. In light of all this, it was recommended to the committee that the president of the Raceway be authorized to negotiate with Digitronics for the best possible terms. At the next Directors' meeting, on April 19, 1960, there was an authorization to contract with Digitronics on the basis of the proposals submitted by Digitronics; under these Roosevelt would acquire a 47 1/2% interest in a distributing company, Yonkers would acquire another 47 1/2% and Digitronics the remaining 5%.

FPI—SS—3-17-72—30M—9153

The negotiations dragged on in the contemplation that a new company, Westbury Electronics Corporation, would be the vehicle of acquisition of the electronic equipment and act as a means of entry into the distribution of such equipment, and it was emphasized that, after the building of a prototype, and subject to its being approved by the New York Racing Commission, or by Raceway itself, there would then be an undertaking to build and complete the first totalizator by December 31, 1962 at a cost of $1,215,000. As nothing had come to a head, finally, at the last part of May, Roosevelt in effect requested Digitronics to proceed on a letter-of-intent basis (because of the importance of Digitronics's proceeding immediately to place the necessary orders for components of the prototype); in its letter to Digitronics, Roosevelt Raceway undertook to save Digitronics harmless from any liability under a contract made by Digitronics and American Electronics for the production of prototype TIMs and such other expenses as Digitronics might incur through its engineering and other work performed for the benefit of the contract and in anticipation of its execution. It was under-

FPI—SS—3-17-72—30M—9153

stood that the indemnity would cease and terminate upon execution of the master contract.

Evidently, work did proceed at that time. On June 1 Digitronics reported to its directors that the formal contract to be executed with Westbury Electronics Corporation was being delayed because of difficulties encountered with Yonkers, but that Digitronics was proceeding on the basis of the letter of intent with the building of the prototype for Westbury Electronics, to be ready by December 1960. By the time of the publication of its year end report to its stockholders on June 30, 1960, Digitronics felt able to characterize the work on the Roosevelt Raceway prototype as "Among the more spectacular systems designed during the year." The prototype was described as "an electronic totalizator which should demonstrate, at greatly accelerated speeds and accuracy (and at sharply lower cost), the electronic recording and computing of bets at the harness and thoroughbred race tracks throughout the world."

It will have been noted that the letter of intent referred to the acquisition of TIMs from American Electronics, Inc.; however, Digitronics was also, through the ubiquitous

Joseph Lease, put in touch with Bell Punch Company, Ltd. in London with a view to working something out to wed the TIMs of Bell Punch and the electronics of Digitronics; and work was going forward also with Taller & Cooper on the production of Hohmann TIMs (two of which were in the end used with the prototype).

While the work was going forward at Digitronics, Joseph Lease, for Western Totalizator, continued to put forward to Roosevelt Raceway his competing equipment and to disparage Digitronics. Meanwhile, Roosevelt Raceway's efforts to negotiate effectively with Amtote had pretty much failed, and, by the end of September, Roosevelt Raceway, although encouraged by Digitronics's reports of progress with the prototype, had questions in its own mind about whether the equipment could be fully operable and able to serve the raceway by May 1961. Accordingly Roosevelt Raceway reconciled itself to negotiating the best terms it could with Amtote looking toward a five year contract with Amtote for equipment at the raceway. Still negotiations were being conducted with the Yonkers Raceway, and nominally with Digitronics, while (at the end of September) it was expected that by November 15 the prototype would be ready for demonstration.

FPI—SS—3-17-72—30M—0153

In this period in which work was getting underway on the actual building of the prototype, after the preparation of the "Exhibit A" and "Exhibit B," (Exs. 94A, 94B) specifications annexed to the contract Exhibit AP, the work at Digitronics was under the direction of Kiehlson; the overall logic was apparently in large part, if not entirely, supplied by Shaw of Electronics.

The connection of Mr. Weida with the project at Digitronics (where it was identified as Job 4726) dates from shortly after Labor Day of 1960. Shaw was an experienced system and logic design man who had worked on one of the historic computers, the ENIAC; he had been in computer technology from the late '40s. The logic was well in hand, and Weida got a lengthy logic write-up from Shaw when the work was turned over to him; much of the construction of the prototype was complete, and much of the wiring done; it was essentially Weida's job to follow through to get operability. The equipment was complete as a first go-around, but it had certainly not been debugged. It was first powered-up in mid to late September, but it did not at once work. There was at least one specific blunder in the system as it

FPI—SS—3-17-72—30M—9153

then existed - in the odds computation and payout part - and that had to be planned around. The first demonstration of the prototype was in mid November (see Exhibits CP, 89, 89A, and AO). The first demonstration, planned for mid-November 1960, was not to include demonstrating the daily double, but only the regular betting capabilities of the prototype.

By January 18, 1961, Digitronics was taking the view that production of the prototype was then virtually completed but that, because of the difficulties with the Taller & Cooper TIMs, the completion of which Digitronics had had to take over, costs of the prototype would be closer to $150,000 than to $100,000; it was also indicated that the anticipated cost of the first totalizator would be $1,500,000 rather than $1,215,000. At this time Digitronics was becoming impatient with the delay in signing the contract and sought to threaten Roosevelt Raceway with abandoning the transaction after delivery of and payment for the prototype; that threat was met with Roosevelt Raceway's insistence that Digitronics could not expect payment for the prototype on contract terms if it abandoned the undertaking to complete the first

totalizator.

Finally, on January 30, 1961, Westbury Electronic Corp. was organized. At the same time, the Digitronics-Westbury agreement was put in substantially final form, except that it still assumed and provided for the participation of Yonkers. It was dated at January 31, 1961, and was signed by Digitronics and Westbury, although, perhaps not until some days after its date. It continued to have as its "Exhibits A" and "B", respectively, the November 1959 specification for the prototype (Ex. 94A) and the February 1960 specification for the first totalizator (Ex. 94B). There was also prepared and ultimately signed by Westbury and Digitronics a guarantee by Westbury to Digitronics of one half of the amounts payable by Westbury under the totalizator agreement and service agreements between Westbury and Digitronics. It had been contemplated that Yonkers would also give a 50% guarantee, but with the later withdrawal of Yonkers from the matter, that portion of the agreement was stricken out.

A copy of the agreement was sent to the New York State Harness Racing Commission under date of February 12, 1961, and about February 23, 1961, Roosevelt arranged to put

$150,000 into Westbury - $99,000 of it as a loan and the balance as the price for 51% of the stock - the $150,000 to be used to pay for the prototype.

The agreement of January 31, 1961, provided in paragraph 2 that Digitronics agreed "to design, manufacture, sell and deliver to Westbury, and Westbury agrees to purchase from Digitronics, a Prototype, meeting the specifications set forth in Exhibit 'A' hereto, and the First Totalizator meeting the specification set forth in Exhibit 'B' ...." There was prepared a proposed modification of the contract which would have altered paragraph 2 to provide that Digitronics agreed "to design and produce a Prototype meeting the specifications ... and agrees to design, manufacture, sell and deliver to Westbury, and Westbury agrees to purchase from Digitronics, the First Totalizator, etc." Paragraph 3 of the agreement, which referred to delivery of the prototype and satisfactory completion of the acceptance test, would have been modified to strike out the reference to "delivery." Similarly in paragraph 4 a reference to delivery of the prototype would have been stricken out,

leaving simply references to completing the prototype. There is no competent evidence that amendatory agreement was executed by the parties. One copy of it was, indeed, signed by the president of Digitronics, but it does not appear that Westbury ever signed it. If the agreement had any purpose, it was apparently to make the formal point that there was not a "sale" of the prototype. The prototype was, in fact, first set up and demonstrated at Digitronics. Somewhere at or about the end of March 1961, Digitronics prepared and sent to Westbury a bill for $150,000 for the prototype showing total material cost and labor charges of $158,478.31 whereof $150,000 was invoiced to Westbury. The prototype was moved to Roosevelt Raceway in early September 1962. Demonstrations of the prototype after that date took place at Roosevelt under the supervision of Digitronics personnel. Ultimately the prototype was stored at Roosevelt Raceway and is still there. In April 1961, when Yonkers Raceway had fairly clearly retired from the transaction, Digitronics in effect took up the Yonkers share of the stock of Westbury for an agreed price of $49,000.

At the April 18, 1961 meeting of the stockholders of Roosevelt Raceway, the president of the raceway advised the stockholders that Digitronics had completed a prototype of an electronic totalizator for Roosevelt Raceway and added, "It operates to the fullest extent we would require. At the moment it is custom built." Later, in the meeting, commenting on Digitronics (and in the context of justifying the Raceway investment in Westbury) the president advised the stockholders that Digitronics "have developed an electronic totalizator that will revolutionize the tote business."

The actual payment of money into Westbury Electronic did not take place until on or about May 1, 1961; at that date formal financing agreements were executed between Digitronics and Roosevelt Raceway. About May 2, 1961 the Westbury Electronic Corp. formally opened its bank account with Morgan Guaranty. On May 10 Westbury drew its check on Morgan Guaranty to the order of Digitronics for $149,000 apparently in payment "on account, for design, development and production" of an invoice of Digitronics dated March 31, 1961 which set up total chargeable production costs per contract of $158,478.31.

FPI—SS—3-17-72—30M—9153

Evidently, at this time, it was recognized that the Hohmann TIM would not do, and in late May, Lease of Western Totalizator Co. undertook to send one of his used TIMs to Digitronics; he pointed out certain of its differences from the Digitronics-Hohmann TIM; these he attributed to the fact that the circuitry of the Digitronics system required the TIM sensing unit to be in constant rotation so that the circuit would be open and waiting for the next operation. He volunteered the comment that, "Your circuit, like most electronic circuits, is not likely to be patentable and follows the usual electronic computer intricacies."

At the May 26, 1961 directors' meeting of Westbury, consideration was given to the TIM question, the possible availability of Bell Punch TIMs and the alternative of using different manufacturers to make the Hohmann type TIM. At the same meeting, Westbury considered the question of producing a totalizator system for testing and demonstration, and Haight, president both of Westbury and of Digitronics, suggested that a 100 window machine (75 regular and 25 daily double windows) be produced by Digitronics for delivery and installation at Roosevelt Raceway at the end of the spring

season in 1962 when it could be vigorously tested and demonstrated to possible customers. Haight estimated the cost at $800,000 including TIMs, of which $200,000 would represent necessary development costs. Westbury resolved to place an order for such a First Totalizator (hereinafter the First Tote), the order for the TIMs to be delayed for the present. This did not fit the terms of the agreement of January 31, 1961, which contemplated that the First Tote would be manufactured and completed in accordance with Exhibit "B" (Exhibit 94B), provided the required approval had been obtained on the basis of the prototype. Obviously, the First Tote in contemplation at the May 26 meeting was not the 470 TIM installation of Exhibit "B" (Exhibit 94B) attached to Exhibit AP which was to cost not more than $1,500,000 and which was to be delivered by June 30, 1962 provided the required approvals had been given, or the First Tote ordered by not later than June 30, 1961.

In the early days of June 1961 Haight tried to interest NYRA in the electronic tote. On July 1, 1961 Alvin Weil, in his capacity as an officer of Westbury, offered to a French race-track entrepreneur a prototype demonstration and

solicited an order for electronic aggregating and related equipment for parimutuel betting in France on a large scale, indicating the need for some developmental time for particular requests that went beyond the prototype, and stating that "At present we are merely attempting to prove that existing techniques now utilized in other fields, may be adapted to the needs of a multiple issuer."

On July 21, 1961 an employee of Digitronics furnished to Haight, its president and an officer of Westbury, the presentation that the employee had used in seeking to interest an Italian group in the all-electronic Totalizator. The presentation stated that the prototype had been produced and successfully demonstrated, and that the all-electronic parimutual system consisted of a complete tote center, TIMs, and infield display board, and other remote display boards around the track, and that the tote center consisted of a scanner, aggregator, odds computer, payoff computer, tote center display panel, and printout facilities. Describing the functioning of the system, the presentation stated that as wagers are made at the TIMs, tickets are issued by the TIMs and that, as each ticket is issued, the wager data are

FPI—SS—3-17-72—30M—9153

automatically transmitted to the tote center (including the amount of the wager, the number of the horse and the designated pool). It was stated that at the tote center the data are entered in the "memory" and checked for accuracy. The data then enter the aggregator, which accumulates all transactions, and thence go on to the odds computer. The computer, it was said, translated all transactions into dollars and calculated the probable odds. The odds computations and totals wagered on each horse in each pool are then transmitted to and displayed at the tote center display panel, the infield display board, and remote display boards around the track. At the same time, the figures are printed out on paper, including the totals wagered on each horse in each category. After each race the payoff computer calculates the payoff for win, place and show and the amounts due the state for tax and to the track for breakage. The presentation noted that all this was done electronically, "and the heart of the entire system is the tiny magnetic memory core. It is this tiny element which permits the computers and other equipment to function so rapidly, accurately and dependably." The tote center, it was said, would cope with scratches, dead heats

FPI—SS—3-17-72—20M—9153

and other variables. The TIMs were described as specifically designed to function with an all-electronic totalizator and to perform more functions than their counterparts used in electromechanical systems. The basic function of the aggregator was described as being to accept all details of all transactions from the TIMs, and to reject unacceptable wagers, for example, an attempted wager on a scratched entry, interdicting the issuance by any TIMs of a ticket on a scratch. The aggregator accepts data from the TIMs, stores them in the magnetic memory cores, keeps all data by number of horse, denomination of wager and win or place or show pool, and duplicates the records kept at each sales window by its TIM. The computers make all required calculations including odds and daily doubles and payoff data. Accuracy in transmitting data from TIM to tote center is assured through use of a special checking code. Two computers are used to check every step in each calculation, with the totals of each computer being checked against those of the other. Each computer can also do its computations twice further to reduce the risk of error, and both computers have internal checking features.

A little later in July 1961, Auerbach, as then president of Digitronics, wrote Bell Punch Co. in London referring to his visit there in 1960 and to a discussion on that visit of the application of electronic techniques to building parimutuel equipment. The letter stated that Digitronics had constructed a prototype electronic totalizator to demonstrate the feasibility of digital electronic technique as an economical solution to race track problems. Stating that the prototype system had been demonstrated successfully to many interested groups, Auerbach said that the company had completed arrangements to sell its first 100 window system, that the system was under construction, and that Digitronics was prepared, but indisposed, to make its own TIMs. Auerbach, therefore, inquired whether Bell Punch would quote him on 100, 300 and 500 unit quantities of Bell Punch TIMs with provision for up to 15 runners, plus a second quotation on the same quantities for only 10 runners or trotters.

Meanwhile, Lynch of Roosevelt Raceway visited Aqueduct on July 28, 1961 to see the Clary solid state computer, IBM printout unit, programming arrangement, and controls for calculation procedure there in use. The equipment was

embodied, Lynch said, in a desk sized console which contained controls for the runners and for odds in connection with the infield display board. The Clary computer was being operated for exhibition purposes in parallel with the original model Burroughs computer; it differed from the Burroughs in being more compact and somewhat faster; it had simpler inputs for the race finish, and the ability to accept a "new call" in place or show finishes without recalculating the entire finish. Lynch timed the equipment at 1 minute and 25 seconds and at 1 minute and 20 seconds for two finishes; that, he said, compared with Roosevelt's best manual time of 1 minute 15 seconds; however, he thought that the Aqueduct system had much better capacity for recalculating when there was a change in calls. Lynch concluded that, while not basically much faster than the best manual showings, the automatic equipment would be consistently quicker, not so variable, and would require considerably less personnel, making possible a savings in payroll of $130.75 a day (plus fringe benefits) for a rental price of about $110 per day.

Under date of August 15, 1961, Westbury formally authorized Digitronics to go ahead with the 100 window First

PPI—SS—3-17-72—30M—6153

Tote for $800,000 or 130% of production costs, whichever was lower. The TIM to be used in the system was to be chosen by Westbury on or before January 1, 1962.

On October 14, 1961 Alvin Weil for Westbury answered an inquiry about electronic equipment by stating that "the Totalisator system about which you inquire is in proto-type and has not as yet been developed for sale." The letter continued by saying that Weil wondered about the inquiry since the system was an "extremely specialized system which would be of interest to racetrack operators."

Apparently, Digitronics was having difficulty arranging for satisfactory TIMs. A trip was made to Montreal, there to examine certain TIM equipment, drawings and tooling of Joly Mfg. Co. The result was a report that they apparently had neither the tooling, the drawings, nor the personnel to do a job of producing Bell Punch type TIMs. Jotted on the back of this communication was a note to the effect that Bell Punch had told Auerbach that Digitronics would buy Bell Punch TIMs directly from Amtote, which, apparently, was believed to contol any distribution of Bell Punch TIMs in the United States. An approach to Amtote is reflected in a

letter of January 12, 1962 (Exhibit CW) in which Digitronics acknowledged receipt from Amtote of one Bell punch double machine, noted the absence of certain reject mechanisms from it, and asked whether it could be purchased without the wiring and relays but with the motor, all solenoids, takeoff switches, etc. and (since it would be without those wirings) at a reduced price.

Meanwhile, and certainly in advance of February 27, 1962, when completed copies of the brochure were mailed out to Kambex Corporation in New York (Exhibit CX), Westbury had prepared a brochure entitled "Westbury Electronic Corp. presents the world's first ALL-ELECTRONIC TOTALIZATOR." The 14 page booklet was illustrated with certain pictures of the prototype taken in June 1961. Among other things, the pictures showed the Hohmann TIMs, and four cabinets opened so that their contents could be seen; the cabinets were indicated as being, from left to right, the scanner, the aggregator, the odds computer, and the payoff computer. An electronic module card was also pictured, one of the very large number of such cards used in the Totalizator. Also included were pictures of the cabinets located at the central

FPI—SS—3-17-72—30M—9153

control area closed and partly open. The equipment was said to be all-electronic parimutuel system equipment consisting of a complete tote center, TIMs, an infield tote display board and other remote display boards around the track. The tote center was said to consist of a scanner, aggregator, odds computer, payoff computer, a tote center display panel, and printout facilities. In the all-electronic Totalizator, the brochure stated, all totalizing and calculating was accomplished with pure electronic digital solid-state equipment with no moving parts. The elements, it was said, were small and compact and utilized electronic module cards, the same as those used in rockets, satellites, and space vehicles; they offered compactness, durability and dependability, virtually never wearing out, according to the brochure. The brochure stated that although the all-electronic totalizator performed many more functions than the electromechanical system, it occupied only 1/3 the space, the use of solid-state electronic components - such as module cards, diodes, transistors and magnetic memory cores to replace large, bulky stepping switches and other electro-mechanical equipment,

FPI—SS—3-17-72—30M—0153

resulting in a much more compact system. The flow sheet of the system was described thus: As regular and daily double wagers are made at the TIMs, tickets are issued; before a ticket is issued, the transaction is automatically transmitted to the tote center, and, only when the wager has been registered, does the TIM emit the betting ticket; the data on the wager consist of the amount of the bet, the horse's number, and the win, place or show pool to which the bet will go; in the tote center the data are entered into the fully electronic memory and are checked for accuracy. The data then go into the aggregator which accumulates all transactions. Thence the data go to the odds computer, which translates all transactions into dollars and calculates the probable odds, and this information is then transmitted to and displayed on the tote center display panel, the infield tote display board, and the remote display boards around the track. For each race, the brochure continued, there is a continuous display of the total win, place and show pools and of the individual horse totals for each pool, the display cycling every 70 seconds. Updating takes about one second to complete. After the first race, possible payoffs for the daily double are

FPI—SS—3-17-72—30M—9153

displayed. After the TIMs are closed, the information is printed out on paper, the print-out including the number of transactions for each horse in each wager category, the dollar totals wagered on each horse in each category, and the number of wagers on each horse at each TIM. At the end of each race, the payoff computer calculates the payoff; it also computes the possible daily double payoffs, the final daily double payoff, and the amounts due to track and state, including breakage. All these operations are done electronically "and the heart of the entire system is the tiny magnetic memory core. It is this tiny element which permits the computers and other equipment to function so rapidly, accurately and dependably." The brochure explained that each TIM can, from the tote center, be redesignated so as to change it from a window of one denomination to another, or so as to render it inoperative. The tote center is also to cope with scratches, dead heats and other variables. In the case of a scratch, the tote center instructs the TIMs not to accept bets on the scratch. The operation of a single scratch button will remove the total pool involving that horse from the probable odds computation or payoff computation. The

FPI—SS—3-17-72—30M—0153

brochure continued: each TIM takes slightly more than half a second to report the details of the wager to the tote center and issue a ticket to the bettor regardless of how many wagers are being made. All machines are scanned four times every second whether the installation is small, or one of 1,000 windows. The brochure stated: in addition to reporting transactions to the tote center, a record is kept of all transactions for each race, for each TIM for each window, and that for the regular machines, a counter is used to record the number of wagers passing through the machine in each race, and, for the daily double machines, a perforated paper tape is punched to record each transaction so that if the entire tote center is destroyed, wagering can continue, and records of all transactions can be obtained from the TIM records to permit hand calculation of the payoff. The brochure explained: the basic function of the aggregator is to accept all the details of all transactions from the TIMs; it accumulates the number of wagers in each denomination for each horse and for each finish-position pool. The data are subject to a four way check through the duplex operation where each computer checks both against itself and against

FPI—SS—3-17-72—20M—9153

the other. The aggregator accumulates the number of wagers for each horse at each TIM subject to a two way check internal to itself. The aggregator rejects unacceptable wagers - for example, a wager sought to be placed on a scratch - and does not allow the TIM to issue a ticket on such an attempted wager. As the aggregator accepts data from the TIMs, it stores the data in the magnetic memory cores; in maintaining these data, it duplicates the records kept at each window by the ticket issuing by the TIMs. The brochure stated: the basic function of the computers is to do all of the required calculations, translating them into dollars. Totals for all race wagers and probable odds are calculated instantly with the probable odds calculation being done every 70 seconds. After each race, the computers calculate the public payoff within 15 seconds after the order of finish is punched into the central control units and in the case of the daily double, in about 10 seconds. Accuracy of transmission of the data from TIM to tote center is assured through use of a special checking code, and accuracy of calculation is assured by using two computers to check each step in calculation, the results being compared to make

sure they are accurate. In addition, each computer can do its own calculations twice - further to reduce the risk of error - and additional internal checking features are built in. (See Exhibit U and Exhibit 120)

At the March 7, 1962 meeting of the Directors of Digitronics, Auerbach reported on the Italian totalizator situation; he indicated that preliminary talks pointed to a 10 year contract with a 2% of gross handle being Westbury's income.

At the Roosevelt Raceway stockholder's meeting of April 17, 1962, Alvin Weil, then president of Roosevelt Raceway, devoted an extended part of the meeting to discussion of Digitronics, Westbury Electronic, the prospects of the use of completely electronic parimutuel betting at Roosevelt, and exploitation of the market for such equipment through Westbury Electronic Corp., in which Roosevelt was a majority stockholder. Apparently display cards were used at the meeting to explain the new tote system, and Mr. Weil used the familiar statement that "the heart of this equipment is a little circular thing that could lie right in the center of the palm of your hand .... This is the memory, this is - or a number

of these, of course, is what takes together all of this information, holds it, sorts it and then puts it out when needed."

In the latter part of May and the first days of June 1962, the plans of Digitronics and Westbury Electronic Corp. took the direction of completing the First Tote as an installation of a 100 TIM system at Monticello Raceway about March 15, 1963, following a demonstration of adequacy at the Digitronics plant about February 1, 1963. The Monticello installation was to be utilized as well for taking bets at Vernon Downs and at Buffalo through some sort of long lines connection, while the control center remained at Monticello. That first installation was to be followed by the completion of a large installation at Roosevelt Raceway by March 1,1964, and the transfer at that time of the central control and computer units from Monticello to Westbury. It was visualized that Aqueduct, too, would be added to the system in March 1964. The whole program, it was thought, might cost as much as $4 million, and, if extended to off-track betting in New York City (provided such betting was legalized), would also include facilities for that operation at another

FPI—SS—3-17-72—30M—9153

$400,000 of cost. At this point, the cost estimates assumed Bell Punch TIMs on the first installation with Westbury Electronic TIMs to be used thereafter. The ambitious program was keyed to approval by the New York State Racing Commission of the Westbury Electronic equipment at the time of the initial demonstration at Digitronics in February 1963. Haight was in the course of going to England to negotiate with Bell Punch for 165 TIMs for use in the First Tote. To assure Bell Punch of payment, Westbury Electronic Corp.'s thin capitalization was to be supported by a Morgan Guaranty Trust Company guarantee backed up by Roosevelt Raceway. (See Exhibits 122, CZ and BE)

In early August the problem of getting hold of Bell Punch TIMs was still, as a practical matter, quite unsolved. There was discussion of maintaining pressure on Amtote to get Bell Punch TIMs from it, speculation about the possibility of getting them from Joseph Lease via Canada, and the possibility that, at least for the hoped-for Italian installation, London might be persuaded to supply Bell Punch TIMs directly for delivery in Italy, despite the risk that they might be

diverted from Italy to the United States. By the end of August, however, Digitronics was in touch with Australian Tote.

Australian Tote indicated a willingness and ability to supply 190 TIMs by the year end of 1962, and Digitronics was interested in trying to work out some arrangement with Australian Tote to supply it with electronic components for its TIMs; Australian Tote seemed to be concerned only with seeing to it that Digitronics did not copy its devices. At the same time, Australian Tote indicated that IBM wanted to discuss not only the design of Australian Tote's machines but also the buying of IBM's TIM requirements from Australian Tote.

By early September 1962, the planning, somewhat changed, was tending to be that final assembly and erection of the First Tote might be at Roosevelt (rather than Monticello). Delivery of the First Tote was scheduled for February 1963.

Still in the early part of September 1962, the negotiation with Australian Tote was pressed, and it appeared that a satisfactory arrangement could be worked out between Digitronics and Australian Tote, starting with the loan of

one machine to Digitronics, to be followed by the delivery of two unmodified machines, all three to be used with the prototype for test purposes. Beyond that, the discussion was over ordering 165 additional machines that would be modified by substituting for their standard "selector arm mechanism" a push-button system and the addition of a relay and adjustment for use with 120 volt direct current rather than 50 volt current. It was visualized that the orders for the Australian Tote TIMs would fulfill the requirements at Monticello, the deliveries being staggered between the partial requirements for the February demonstration and the complete requirements for the March installation, presumably at Monticello. At the same time, however, discussions continued with Joseph Lease for the delivery from Joly Mfg. Co. in Montreal of 200 regular and 60 quinella TIMs of the Bell Punch type, 148 of which were said already to have been assembled for another race track which had failed to complete the purchase. These were supposed to be deliverable by the end of January 1963. Digitronics wondered whether the person behind the Lease offer might not be Bell Punch itself, acting through Lease. In any event, the negotiation with Australian

Tote (which will hereafter be referred to as Atusa, indicating Automatic Totalisators (U.S.A.) Ltd.,) was proceeding to the point where at the end of September Digitronics and Atusa were discussing specific contract terms, and Digitronics was expressing a preference for the Atusa TIMs over the Hohmann TIMs which it had worked out with Taller & Cooper. By October 10, 1962, Westbury, and presumably Digitronics, were proceeding on the assumption that Atusa would make J10 push-button TIMs available in time for the demonstration in February 1963. One type of J10 apparently could be switched from regular to daily double betting very simply, and it was the view that only 120 machines would be needed, 40 of these to be converted to and from daily doubles operation. That circumstance, it was reckoned, would bring the cost of the Atusa TIMs within the projected budget for the project.

Amtote, apparently, had been given some sort of an order for 152 Bell Punch TIMs, but it was understood that Amtote had not unequivocally accepted the order, and Westbury determined to terminate the order for all except 13 Bell Punch machines to be delivered in October 1962. Apparently there was also under consideration a proposed development

contract with an outside firm for an on-track and off-track TIM, with, apparently, some expectation that the on-track TIM might be "more important to the February demonstration than the off-track devices."

At length, under the date of October 30, 1962, a letter agreement was signed between Westbury Electronic and Atusa covering 122 J-10 TIMs ordered for Westbury Electronic Corp. by Digitronics Corp. at a total cost of $246,226 FOB Sidney, Australia. Twenty of the machines were to be shipped not later than January 15, 1963 and 101 machines were to be shipped not later than March 31, 1963. The carrier was to be designated by Westbury (which was, of course, to pay the freight).

Meanwhile, at the beginning of November, it was, in light of certain financing which Digitronics was trying to arrange for itself, more or less agreed between Westbury and Digitronics that the January 31, 1961, agreement had become obsolete because of the later conduct of the parties, and that they needed a new agreement. However, without any new agreement, the parties were working along on the completion of the First Tote. At a meeting in Phoenix in late November 1962, held to discuss technological advances, the contract

between Atusa and Digitronics was disclosed, that the Atusa TIMs were being modified or adapted to the new Digitronics tote, and that there would be a complete display of the Digititronics Tote in mid February at Roosevelt Raceway, which all were invited to attend. The representative from the New York Racing Association (NYRA) indicated that the meeting had produced a lot of interesting talk, but nothing concrete; he stated, however, that if someone really came forward with something, NYRA would go anywhere to inspect it.

In early December 1962, Amtote was pressing Monticello to renew its Amtote contract emphasizing Amtote's improvements in its equipment over the years, including its use of solid-state or transistorized computer elements, and warning Monticello that any new device would require far more testing than non-technical people appreciated, and that this was particularly true of equipment intended for racetrack use because of the sharp contrast between laboratory or office conditions and actual operating conditions at a race track. Amtote closed by giving Monticello until December 31, 1962 to sign up for a new contract.

About the middle, or a little after the middle, of

December 1962, Amtote delivered to Westbury through customs, 13 Bell Punch machines for $20,839, ten of them regular machines and three of them daily double machines.

During the year 1962 construction of the First Tote was progressing under the superintendence of the patentee, Robert L. Weida, and in December 1962 it was moved to Roosevelt Raceway. By February 12, 1963, the work was so far complete that 20 TIMs could be in use and accept bets, odds could be computed, payouts calculated and readouts set up visibly. It had already been decided that the First Tote would be given an essentially public demonstration on March 6, 7 and 8 at Roosevelt Raceway. The demonstration contemplated would, again, have used 20 TIMs and there appears to have been little doubt in the minds of the people at Digitronics that the demonstration would be successful. For example, in a letter written on February 12, 1963, to a London insurance broker, Westbury or Digitronics, or both, expressed interest in finding out whether they could offer, with the Totalizators that they were to market, insurance against losses incurred through breakdowns in the electronic Totalizator. In describing the Totalizator, Haight (then functioning both in

Digitronics and in Westbury Electronic) said that while it was believed that this first electr. c totalizator would obsolete existing electromechanical machines, "... there is virtually nothing in our device which has not already been incorporated in other machines which we have installed for other purposes in such companies as ..." - and he named a railway and three large industrial companies. His letter continued that, as applied in race tracks, the electronic Totalizator did represent a new departure, and hence it seemed a logical service in advancing the art to provide, if possible, an insurance policy that would cover race track owners against loss.

The prototype had, of course, been demonstrated while it was at Digitronics, and had been used in the attempts to promote sales to NYRA and to the Italians; it was, after it was moved to Roosevelt Raceway in September 1962, demonstrated there. However, the demonstration of the First Tote, which did take place on March 7, 1963, was a spectacular success.

The patent application was prepared starting in January 1963 and it was completed and filed by March 28, 1963. The draftsman of the application was Camil P. Spiecens. He made use of the logic diagrams and of interviews with the various

people concerned in the construction of the First Tote to get the material for the application itself and for the figures used in it; the application was drafted rapidly because it was anticipated that there might be a sale to the Italian group and it was imperative that the patent application be on file in the United States before any sale was made, for otherwise, there could have been no filing for a patent in Italy.

Mr. Spiecens was not told anything about the prototype, and he did not see it or any materials connected with it. He was not shown the brochure written around the prototype (Exhibit U), and he did not know of it. He blocked out the drawings annexed to the patent application, which became the figures of the patent as issued. They were not prepared from detailed working drawings for the equipment itself, but from plant block diagrams and Mr. Spiecens worked with the engineers to come up with block diagrams for the application. Mr. Spiecens also drafted the response to the first office action. There was no interview with the Examiner before the application was granted. The petition for a certificate to corrections was not prepared by Mr. Spiecens.

Spiecens did not see the February 1960 specification of Digitronics for a Fully Electronic Totalizator, but he did recall that at some time he saw Figure 1 of "Exhibit A" (Ex. 94-A) attached to the "January 31, 1961" agreement, Exhibit AP.

The relation between the prototype and the First Tote remains most uncertain. Mr. Weida did not commence to work on the prototype until after Labor Day in 1960, and, although it had been powered up and tried out earlier, as early as late September 1960, perhaps, it was first "demonstrated" in mid November 1960. Mr. Weida replaced Kielsohn on the prototype job (Job No. 4726), and, as found above, when Mr. Weida took over, the equipment was partly wired, he was given the logical design drawings to write up and check, he got the apparently lengthy logic write-up from Shaw, one of the designers, and he talked to Shaw about it, and - in a word - much of the construction was already done and the logic was in hand. Mr. Weida's job was simply to follow through to get operability: the system was complete as a first go-around.

As it happened, none of the people who had worked on the prototype before Mr. Weida took it over worked on the

FPI—SS—3-17-72—30M—9153

First Tote. Mr. Weida said that the prototype did not "interrogate" the TIMs, nor electronically signal an "unlatch" for rejection, and that the prototype had little peripheral equipment. The prototype, he recalled, could not handle regular and daily double betting concurrently. The prototype, Mr. Weida thought, did not have reject signal responsive means, and error detection resulted simply in shutting the operation down until the central control started it up again. The prototype, Mr. Weida said, did not put out a bid signal and it had no false entry or scan test.

It is all but impossible to understand how the prototype could have left so dim and uncertain an image after it. Mr. Weida was able to recall that when he took on the job of finishing the prototype, he got 15 to 20 pages of carbon-copy material respecting the operation of the logic and about 20 logic drawings (Tr. 1247-1249), and that he kept these papers for a year or two but cannot say where they went thereafter. There were at least circuit schematic drawings and structural working drawings of some sort, but Mr. Weida does not recall having seen the Exhibit A (Ex. 94-A) annexed to Exhibit AP, The drawings available to him were in the drafting room files.

Whatever the differences, Mr. Weida agreed that Claim 20 of the patent could be read on a mental reconstruction of the prototype but for the requirement that it contain a plurality of TIMs. However, the evidence warrants the finding and it is found, that in fact the prototype had been demonstrated with two Hohmann TIMs in service, and the simulators, while not genuinely TIMs, would appear from the point of view of their model or demonstration roles to qualify as valid models of "plurality"; their existence is not otherwise justifiable. Mr. Weida appeared to agree that Claim 21 could likewise be read on the prototype, with the same limitation presumably.

The great difficulty was that the drawings for the prototype had completely disappeared, except for one irrelevant drawing, and disappeared without any satisfactory and reasonable explanation of their disappearance. A number of drawings related to Job No. 4726 are listed in Exhibit R but the evidence was that they were missing from the drawer in which they would have been stored. They were uniquely missing; the absence of the drawings reflected a discontinuity in the files.

FPI—SS—3-17-72—30M—9153

When the prototype was transferred to Roosevelt Raceway, a set of the drawings went with it, and perhaps the originals, although that is not at all clear; they were not produced from that source, and perhaps they were not available from that source. The prototype itself remained in storage at Roosevelt Raceway, but it appears to be more or less agreed that the task of trying to determine from it at this date the circuitry and capabilities of the device would be enormous because of the multiplicity of components and the quantity of circuit wiring in any such device.

The continuity of conception evinced in the succession of the May 11, 1959, presentation (Ex.F), the November 1959 outline of the planned prototype (Ex. 94A), and the February 1960 specification for the fully electronic totalizator (Ex.94B); the complete change in personnel assigned to the completion of the prototype at Labor Day 1960; the disappearance of all drawings and of all material relating to the logic of the prototype as the prototype and its logic existed in incompleteness at Labor Day 1960; the unexecuted modification of the Digitronics - Westbury contract of January 31, 1961, which would have eliminated the "sale" and "delivery"

FPI—SS—3-17-72—30M—9153

language as applied to the prototype and preserved it as to the First Tote; the continuity of conception evinced from the May 11, 1959, presentation to the February 1960 specification, and found in persistence in the Italian presentation of 1961 (Ex. CX), the brochure of 1962 (Ex. U), and the patent itself (Ex. 1); the patent solicitor's ignorance of the existence of the prototype, of the brochure (Ex. U), or of the early logic writeup of Shaw; Mr. Weida's assent to the idea that, but for the "plurality" of TIMs point, Claims 20 and 21 could be read on the prototype; these are circumstances that, notwithstanding the unshrinking frankness of Mr. Weida's testimony, preclude a finding that the patent presents a conception of the subject matter of the claims of the patent that is of the patentees' invention.

The named patentees, then, had no role in the preparation of Exhibits AP, 94A and 94B; none of them had a role in evolving the design, logic or choice of components of the Demonstrator or prototype; and only the named patentee Weida had any part in the final preparation of the prototype for start-up and demonstration; the contributions of the named patentee Weida to the prototype were at best corrective of

FPI—SS—3-17-72—30M—9153

blunders in logic detail or implementation and did not either change the controlling logical schemata of the prototype or the plan of tangible embodiment that his predecessors on the project had developed; plaintiff is solely responsible for the substantively unexplained failure to preserve and produce any block diagrams, circuit diagrams or detailed drawings of the prototype or any exegesis of its logic; and the patent solicitor who drafted the patent specification, claims and the single response to the first office action had no access to those responsible for Exhibits 94A and 94B and for the design, the logic and the supervision of construction of the prototype, did not see the prototype or any demonstration of its operation, did not learn of Exhibit 94A of November 1959 nor of Exhibit 94B of February 1960 (although the latter was directly related to the First Totalisator which was the subject of the patent application he was drafting), and did not know of the printed/sales brochure of March 1962, Exhibits and published U, 120 (although a hoped-for Italian sale occasioned the hurried preparation of the patent application on which he was engaged). The testimony of the named patentee Weida leaves no doubt that Claims 20-22 read on the prototype and that the

attempt to distinguish the claims made at the trial as not speaking to a plurality of TIMs (Tr. 1814-1823) is wholly unsubstantial (infra, pp. et seq., Findings 39-44). Denied access to everything except the First Totalisator and to those persons named in the patent as patentees, the draftsman of the patent specification and claims had not the means to and did not disclose to the patent office examiner or refer in the patent application to the prototype or the published advertising brochure.

Inevitably, the prototype or demonstrator is prior art of other inventors against the patent in suit. It cannot be said that a curable omission of joint patentees is all that is present; 35 U.S.C. 116, 256 countenances no such procedure. The named patentee Weida cannot be treated as a joint inventor both of the prototype and of whatever, if any, improvement on the prototype may have been represented in the disclosure of the patent in suit and embodied in the First Totalisator. Rival Mfg. Co. v. Dazey Products., W.D. Mo. 1973, 358 F.Supp. 91, 102. It is no answer to point out the fact that all the Digitronics personnel involved had alike signed agreements entitling Digitronics to claim from them assignments of their patents and patent rights growing

out of their work for or related to the business of Digitronics.

The prototype was repeatedly and successfuly demonstrated more than a year before the patent application was filed. It was delivered to Roosevelt Raceway in 1962 and has since remained there, and the costs of its manufacture were paid for by Westbury. However, the demonstrator or prototype was not practically operable as a racetrack totalisator; it was a demonstrator only; not a toy, not a model; it was a full scale demonstrator and it was meant to be used and was used first as a demonstration to Roosevelt Raceway and, later, as a demonstrator for Westbury in its sales efforts; it had been hoped it might be used to get state approval of the full sized totalisator of Exhibit 94B (Exhibit AP, Exhibit B), but that was not accomplished. But neither such "sale" as there was of the prototype (and nothing turns on the inept effort to rewrite the contract, Exhibit AP), nor such use as was made of the prototype as a demonstrator, reached the disabling level that 35 U.S.C. 102 marks as being "in public use or on sale in this country."

FPI—SS—3-17-72—30M—9153

The sale was not on commercial terms for the ultimate use to which the projected finished product would be devoted, nor was the use, if public, a use of the article of the patent rather than a use of an illustrative but commercially incompetent prototype of the article of the patent, and it was not a use for the purposes to be served by the article of the patent but a use in order to demonstrate the validity of the scheme of the article of the patent. Cf. Cali v. Eastern Airlines, Inc., 2d Cir. 1971, 442 F.2d 65, 70-71; In re Yarn Processing Patent Validity Litigation, 5th Cir. 1974, 498 F.2d 271, 277, 282-285; Jack Winter, Inc. v. Koratron Co. Inc.,N.D.Cal. 1974, 375 F.Supp. 1, 37.

The printed and published brochure, Exhibit U, has a two-fold importance. First, within Section 102(b) it is beyond question a printed publication in this country; if it discloses an invention, whether that of the patentees or of that of Shaw and Kielsohn, that is final: it is either (or both) prior art against the patent (Section 102(a)), or a disabling printed publication (Section 102(b)). Second, it relates, along with Exhibit 94B, to the sale of the First Totalisator, and, by its relation to the prototype, viewed

as a reduction to practice of the invention of the patent (although it is rather a reduction to practice of the invention of Shaw and Kielsohn, the predecessors of Weida, et al.), relates to the idea that there can be a sale of future goods that is disabling under Section 102(b) if the article is one that in ordinary trade would be sold as future goods to be built and if, at the time of contracting, it is sufficiently defined, provided, at minimum, it has been reduced to practice in some reliably, complete manifestation. Can it fairly be said that the First Totalisator was on sale a year before the filing of the patent application drawn from the First Totalisator as it was completed and before it was publicly demonstrated? Cf. Jack Winter, Inc. v. Koratron Co., Inc., supra, 375 F.Supp. at 37; Kalvar Corp. v. Xidex Corp., N.D.Cal. 1973, 384 F.Supp. 1126, 1130-1138; Philco Corp. v. Admiral Corp., D.Del. 1961, 199 F.Supp. 797, 814-818. Contrast Burke Electric Co. v. Independent Pneumatic Tool Co., 2d Cir. 1916, 232 Fed. 145, 146-147, 234 Fed. 93. Robbins Co. v. Lawrence Mfg. Co. 9th Cir. 1973, 482 F.2d 426, 431-433, may be taken to suggest that in the case of a sale of future goods to be built to specification, where there is no

fully operative device in existence, a finding that the article of the patent had been put on public sale could rarely be warranted. The history of the "sale" of the First Totalisator does not reach any of the uncertain benchmarks that the cases seem to limn. Roosevelt Raceway's shilly-shallying, the cutback in scale, the groping for cost savings and for a ceiling on costs that kept running out of hand, these fluid factors combine to preclude a finding that there was an August 1961 contract to sell the First Totalisator as an article complete in design, specification and detailed drawings and adequately exemplified as a feasible device by the prototype. Without such a finding, it cannot be held that there was a disabling contract to sell within the meaning of 35 U.S.C. 102(b).

FPI—SS—3-17-72—30M—9153

II

Untangling the patent from the bramble of unfamiliar terminology is not very easy, but the 25 day trial illuminated the darker corners and, it is believed, made possible a reliably simple explanation of the teaching of the patent against the background of the prior art. Analysis leads inevitably to the conclusion that the claims of the patent now in suit, claims 20 through 27, are not valid claims.

To start at the beginning, data processing, whether mechanical, electromechanical, electronic, or solid state electronic, takes advantage of the facts that numbers can be reduced from decimal or whatever other number base is used to binary notation in which the only digits are zero and 1, and that the steps or stages of mathematical reasoning can be starkly expressed in algebraic form, not so far removed as might at first seem from Aristotle's use of letters in, for example, the Prior and the Posterior Analytics. As will be seen, the patent refers to a Boolean equations (Columns 11-15); the reference is to George Boole and to his epochal alegebra of classes. In his book, An Investigation of the Laws of

Thought, on which are founded the mathematical Theories of Logic and Probabilities, he says:

> "Hence, instead of determining the measure of formal agreement of the symbols of Logic with those of Number generally, it is more immediately suggested to us to compare them with the symbols of quantity admitting only of the values 0 and 1. Let us conceive, then, of an Alegebra in which the symbols x, y, z, &c. admit indifferently of the values of 0 and 1, and of these values alone. The laws, the axioms, and the processes, of such an Algebra will be identical in their whole extent with the laws, the axioms, and the processes of an Alegebra of Logic. Difference of interpretation will alone divide them." (Boole, The Laws of Thought, Dover Reprint of the 1854 edition, pages 37-38.)

According to tradition (see Exhibit K) it was in 1938 that C.E. Shannon demonstrated that a Boolean algebra could be adapted to the presentation of data processing circuitry, and could be used in evolving and simplyfying data processing circuitry. The principles of the Boolean algebra involved turn on the limitation of values to 0 and 1, the recognition that the Boolean algebra involved is essentially an algebra of classes, and the fact that a system limited to the values 0 and 1 could nevertheless also be used for limitless enumeration as the digits of a binary (or base 2) system of numbers. In

Boolean algebra as a logical system the rules of operation take an unusual form (as explained in Exhibit K, Chapter 2 of Richards, Arithmetical Operations in Digital Computers). The familiar plus sign has the meaning of "or"; the multiplication sign (indicated by the x, the dot, or simply by writing two letters close together without punctuation or separation) has the meaning of "and"; with the logical reading that 0 plus 0 equals 0, as always; 0 plus 1 equals 1, as always; and 1 plus 1 equals 1, because, in the logic of this Boolean algebra, the expression means that 1 or 1 equals 1, or, to put it another way, it states that if there is a class of 2 members either or both having a certain defining characteristic, then a statement that one or the other or both members of the class have the defining characteristic is true, otherwise it is not. Mr. Weida (one of the patentees) in Exhibit 149 put the ideas of this arithmetic in essentially truth table form; using instead of 1 and 0, or "true" and "false," 1 volt and 5 volts where 5 volts represented the critical voltage required in the circuit, he essentially was using truth table analysis of what is meant by disjunction. That is, treating the plus sign as the sign of disjunction,

FPI—SS—3-17-72—30M—9153

then A plus B equals C would yield the following truth table:

A	or	V	+	B	or	V	=	C	or	V
F		O		F		O		F		O
T		5		F		O		T		5
F		O		T		5		T		5
T		5		T		5		T		5

In Figures 2, 3 and 4 of the patent, Exhibit 1 and in the specification, if it is intended to show or state that two input wires are to energize a third wire beyond a certain gating point if either or both of the input wires bears a signal at the critical voltage level but not otherwise, the input wires are shown entering a square labelled "0" (the symbol for an "or" gate)and one wire is shown emerging from that gate. The circuitry significance is that if either or both input wires are energized to the critical voltage level, then the "or" gate will permit the energization of the efferent wire; it will interdict energization of the emerging wire if, but only if, neither of the input wires is energized to the critical voltage. In the figures of the patent, conspicuously figures 3 and 4, the "or" gates are numbered as [illegible]

well as identified as "or" gates by the letter O. So in figure 3 at the very top towards the center will be seen a square box with the identification 01. It is illustrated with four input wires along which signals could proceed. In the logic of the device that means that if any one or all of the inputs to the "or" gate "01" is energized, it will sends an energizing signal to the next component, in this case the step pulse generator. Other "or" gates will be seen in figure 3, conspicuously, "or" gate "03" at the lower left which has five input and one efferent wire, again signifying that if any one or more or all of the input wires carries energy at the critical voltage level then the efferent wire will be energized.

In the Boolean algebra of this circuitry the multiplication sign is identified as "and," with the immediate Boolean algebraic significance that 0 times 0 equals 0, 0 times 1 equals 0, and 1 times 1 equals 1. The multiplication, or "and," function in the Boolean algebra of computers means that if, and only if, all of the inputs are 1 will the output of the "and" gate be 1. Mr. Weida illustrated this in exhibit 149, and, again, extended the form of the truth table to

FPI—SS—3-17-72—30M—9153

gather in the "and"gate function. Put in true/false truth table form, and in parallel with A times B equal C, the table would be as follows:

A	or	V	X	B	or	V	=	C	or	V
F		0		F		0		F		0
T		5		F		0		F		0
F		0		T		5		F		0
T		5		T		5		T		5

Referring to figures 3 and 4 of the patent, Exhibit 1, the "and" gates will be seen to be those which are identified by an "A" followed by a numeral inside a square. In figure 3 at the upper left hand corner is "and" gate 1. It is shown with two input and one efferent signal wire and has the effect that if, and only if, both input wires are energized to the critical voltage will the "and" gate energize the output wire leading to the next gate, which is "or" gate 1, mentioned above. In figure 4 at the extreme left and near the top of the figure will be seen "and" gates A8 and A9, each shown with three input wires and one output wire. The significance in each case is that if, and only if, all three input wires are

appropriately energized will the output wire leading to the "or" gate 05 be energized. It will be seen here that "or" gate 05, which receives its input from "and" gates 8 and 9, will energize its output wire if the gate's input is energized from either or both of "and" gates A8 and A9. (It will be noticed that all the signals shown as entering A8 have a capital A in their identifications and all those entering A9 a capital B in the signal identification. This reflects the fact that, as figures 1A and 1B illustrate, the system of the patent has duplicate units identified as A and B.) The sense of the A8, A9, 05 gating is that if either the A or the B side is energized at the required level, or both sides are so energized, the "or" gate 05 will send a signal to "and" gate A10, which in turn, will emit signal SCNI if, and only if, it receives signals from all of "or" gate 05, "flip-flop" CONA, and "or" gate 017. Only if neither the A side nor the B side signals are sufficient to energize their respective "and" gates A8 and A9 will "or" gate 05 fail to send on a signal to "and" gate A10.

The logic of the Boolean algebra employed contains the idea of negation with the necessary consequence that the

FPI—SS—3-17-72—30M—9153

negation of 0 is 1 and the negation of 1 is 0, since they are the only digits or values used in the symbology. The negation of any variable is indicated by putting a bar over it or using a prime mark to the right of the letter or letters identifying the variable. In the specification of the patent the prime mark is used. The logical principle of the Boolean algebra that 1 + 0 = 1 requires the conclusion that, using A as the variable, A plus A' equals 1. Similarly, A times A' equals 0, since, as above, 1 X 0 = 0. And, finally, A" = A. That is, a negation of a negation is the equivalent of an assertion, and this will be true whether A is 0 or 1, since the negation of 0 is 1 and the double negation of 0 is 0 and the negation of 1 is 0 and the double negation of 1 is 1. The negation function is employed in computer algebra and is illustrated in the circuitry of the patent by a square box in which there is a letter I, meaning inverter, followed by a number. The effect of the inverter is that if the input is a critically, positive voltage, then the output negates the functional significance of that critical input voltage. More generally if the input is 1 then, for circuit purposes, the output is 0, and vice versa.

The negation function is illustrated in figure 3 of the patent at the upper left as square boxes 11 and 12.

The specification repeatedly refers to flip-flops, best seen at the right side of figure 3; the five large squares each with a "0" near the top and a "1" near the bottom, and with identifying letters "TFBF," etc., inscribed in the middle of the box, are flip-flops. In the middle lower left of figure 3 there is a box that has inside it the identification "ERAF"; it is a flip-flop, but, apparently through error, the 1 was not inscribed in it.

The flip-flop function is explained at pages 47-49 of Exhibit K. Very broadly it is a "bistable" function which has the capacity to store a 0 or a 1 until it receives a new pulse(of appropriate voltage) which changes its state to the opposite. That is, if it is in 0 stable state, the impulse will change it to 1, and if it is in the stable state 1, the impulse will change it to the stable state 0.

Finally, in the figures of the patent, Exhibit 1, there appear a number of "delay" units symbolized by a square box in which there is a letter D together with an identifying number. One such is shown in figure 3, at the bottom center, as D4. Two other delay units will be seen higher up in

figure 3 just below the midline; others will be seen at the right of the figure.

The specification and figures of the patent are largely written in the language and using the symbols exhibited and discussed in Exhibits K, M, N and L, all excerpts from Richards, Arithmetic Operations in Digital Computers, which is referred to in the patent at column 12, lines 3 to 5, lines 10 through 21 and lines 32 through 36; at column 13, lines 53 to 56; and at column 15, lines 26 to 31 and lines 58 through 60. It will be seen particularly in Exhibit K that Richards, a 1955 publication, conducts much of the discussion in terms of the logical diagrams without reference to the particular means of performing the logical function, and that he explains their use with either solid state diodes, or vacuum tubes, or electromechanical relays.

FPI—SS—3-17-72—30M—9153

Two other preliminary matters are needed for a good reading of the patent. The patent repeatedly refers to memory, and memory is manifestly a basic part of data computing and solid state electronic data processing. The individual building block of the memory or core memory is a tiny toroid or anulus which can be polarized, in the sense of establishing the direction around the periphery of its magnetic field, either in a clockwise or counterclockwise direction; it can maintain the direction of polarity of its magnetic state until the polarity is reversed by a fresh impress of current upon it. The toroids used in the memories here involved are apparently 1/16 inch or less in outside diameter and can each store only one "bit" or information datum, since they have only two states, counterclockwise and clockwise magnetic fields. As the system is aimed at the use of a binary logic, inevitably the two states are read as one and zero. A memory core to be useful, then, must have a very large number of toroids in it, and, since each one of them has only the capacity to represent a part of either a 1 or 0 that is either/a binary number or part of some numerically encoded information that is in storage, or is being brought out of or restored to storage, it must be locateable

and accessible. In the language of the patent and the art, it must have an address. Physically, the memory may be a cube or other rectangular solid in which the toroids are stacked like poker chips in row and column. A memory might measure 64x64x25 toroids, each at a fixed and permanent location in the memory, and each individually accessible to wire conveyed impulses that impress on it a clockwise or counterclockwise magnetic field, and, therefore, a 1 or 0 significance. To determine, and by determining to "read out," its 1 or 0 meaning, a current is applied to it which will alter its polarity of magnetization (and in so doing emit an output signal) if it is in one state but not if it is in the other state, thus extracting its "bit" of information from it. For whatever purpose, that bit has been retrieved. See Exhibits 13 and BN, BO and BP. Since every such bit will have been "read out" from and restored to an identifiable location on a specific magnetic toroid in the same or altered state, a change of its state between pre-readout and post-restoration, from 1 to 0 or 0 to 1, reflects the alteration of the binary number-place which it represents; that is, it reflects an addition or subtraction. For example, if a toroid represented

the first number-place at the right end of a binary number, and had been 0, and upon restoration, it is 1, then it will be plain that one wager (or whatever) has been added to the "word" in the memory of which that toroid's bit of information formed a part. The same thing will be true whether the position of the toroid is at the extreme right number-place or any of the other number-places along the row of a binary number. It will reflect either a change in the quantity represented by that number-place or a retention of it, for not every addition to a binary number changes the state of every number-place in the number. The number 101 in binary notation, when it has one added to it, becomes 110, the number-place at the left remaining unchanged. In the memory illustrated in Exhibit 13, the "words" stored are represented by stacks of 25 toroids, a "long" enough word to accomodate a very large number together with keying data necessary to the effective handling and processing of the number.

Sections of the memory can also store, coded in binary numerical form, instructions to govern the steps in the functioning of the device, so that no human operator is needed to take the results of one step in the process and

set in motion the next operation, as is required with calculators. The stored instructions are drawn from the memory and entrained with the data being processed so that they can perform their roles as active signals operating on the data through the circuitry provided in the device.

As Exhibit 13 illustrates, each magnetic toroid is reached for its bit of information by being found at the intersection of two wires which traverse its open center. Advantage is taken of the fact that each magnetic core toroid can be magnetized to saturation so that added current in the same sense will not change its magnetic polarization, and that if it has one polarity, it will take a critical amount of current to switch its polarity reading from 1 to 0 or from 0 to 1. Since it takes an intersection of two wires to locate the toroid in the memory, less than the critical current is applied on each of the "select" wires that range the memory from two directions to intersect at the toroid. Since neither wire has the critical amount of current on it, they will not change the state of any of the toroids they traverse until they meet at the toroid of choice; there the union of the two less than critical currents, summing to a more than critical

current, will change the polarity of the toroid if it is opposite to that of the select currents or leave it unchanged if it is of the same polarity. The change in polarity is read out on a sense wire as a wave form pulse, leaving the core toroid bereft, but receptive to restoration of the same or a different magnetic polarity after the operation is complete. The read-out of a pulse or of no pulse is, of course, equally communicative of the toroid's stored bit of information.

Such a read-out is "destructive." To restore the "word" to its "address" in the same or altered form requires the regeneration of the location by fresh signals.

A second aspect of the reading of the patent involves the interpretation of the lines drawn on the figures and the progress of signals from one to another place. Signals, that is, data communicating signals which will communicate 1 or 0 from one point to another can, evidently, be a sequence of timed electronic events speeding along a single wire, or the signals can proceed along parallel wires, and, plainly, the latter is, in a subworld of blindingly fast travel, much quicker, since all the data are communicated in the

lapse of time required for communicating a single impulse. Hence, while most if not all of the wired connections in the figures of the patent are shown as single wires, that is schematic. In many cases the single wire is really a bundle of distinct strands each capable of transferring one bit simulatneously with the transfer of other bits on other strands of the same "wire."

As stated above, the patent is not easy to read and the reading is complicated by the fact that the specification is written around the daily double capability of the system and its use substantially throughout of duplicate components and duplicate processing of the critical signals, neither of which aspects of the patent is involved in claims 20 through 27, the only claims here involved. Plaintiff introduced the case by having the first named patentee, Robert L. Weida, testifying as an expert, explain the system from the patent's summary, and then take a wagering transaction through the system. That involved something more and different from what he did later in applying claims 20 to 27 to the figures of the patent to show the significance of the means specified in each of the

claims and how they functioned. These approaches require a reading of the specification of the patent, and the reading becomes important in part because of plaintiff's reliance on so much of Section 112 of the Patent Law as provides that

> "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

In an effort to make the specification more readable, sketches of the figures of the patent (Annex B, C and D) have been prepared which, so far as is possible, are restricted to the matter necessary to the reading of the claims in issue and can yet indicate the working of the whole system as a "simplex" rather than a "duplex" system, eliminating daily-double circuitry where possible.

Annexes B through D present versions of the Figures of the patent (1A, 1B, 2, 3, and 4) from which have been eliminated the "B" elements, those elements limited in their use to the dual aspect of the system or to daily double betting, and elements not germane to the claims, and Annex A presents a

FPI—SS—3-17-72—30M—9153

version of a block diagram showing, in the main, the components germane to the claims in a form that seeks to stay close in usage to the Figures of the patent.

III

The patent is entitled a patent on a "Data Processing System" and each of the claims in suit is a claim upon a "system comprising" a plurality of TIMs or a TIM followed by a combination of particular means. The specification then continues - and so much of it is paraphrased as relates to the claims and is needed to explain the role of the matter covered by the claims:

The invention pertains to data processing systems and more particularly to systems for processing data received from TIMs, one of the commonest of which is a parimutuel system for servicing wagers on sporting events. Existing systems are slow operating, of only average reliability, are dependent on much human assistance and have limited versatility. Such systems, however, can neither tolerate down time during the wagering nor errors in processing wagers. A general object of one aspect of the invention relates to down time and reliability.

FPI—SS—3-17-72—30M—9153

Downtime and reliability aspect: A data processor is provided for processing transactions having a plurality of pairs of units, each unit duplicating the function of the other, but one being the master and the other the slave unit. Disregarding the pairing aspect, checking means are included in each separate unit for checking for erroneous transaction signals so as to transmit an erroneous-transaction indicating signal to the master selecting means. The invention includes various checking means for detecting erroneous transaction signals, for deactivating the data processor when the checking means in both paired units detect erroneous transaction signals in them, and for rendering ineffective the unit which detected erroneous transaction signals. A general object of another aspect of the invention is to provide a high speed scanning means for interrogating a plurality of relatively slow operating TIMs for transactions.

High speed scanning aspect: Scanning means are provided for sequentially and periodically selecting each TIM for interrogation. [illegible] Interrogating means transmit an interrogation signal to the selected TIM. If the selected TIM is prepared to make

a transaction, it will transmit a selected transaction signal. Means sense for the transmission of the selected transaction signal which, if not sensed, causes the scanning means immediately to step to another TIM for interrogation of it.

A feature of this aspect of invention insures that succeeding attempted interrogations by the scanning means of a TIM which has had its transaction either confirmed or rejected do not cause the transmission of redundant selected transaction signals.

Daily-double etc. versatility: An object of the invention is to provide a more versatile system by providing for another aspect processing sequential multi-entry transactions such as daily double wagers.

The system includes a plurality of TIMs which accept transactions on entries in a horse race (for example). The transactions are operated upon by a data processor. The data processor includes common units such as a Console, a Scanner, Buffers 1a to NA (there being one buffer for each horse running in the race), a transaction processor MRA (all seen in Fig.1-A) and a transaction calculator TCA seen ~~XX~~ enclosed in dotted

lines at the lower left of Figure 1B. The transaction calculator TCA includes a plurality of registers (MEM A), a portion of which are aggregator registers; aggregated transaction updating means (UAA); a computer (COMA); ("Error Unit" ERCA) and an acknolwledge unit (AKA).

The system of the patent is described operating in the dual mode with the A side as the master. The left hand units in Figures 1A and 1B have reference characters ending in the letter A. To paraphrase the patent in its simplex mode, using the A side, requires some references to the A master signal means and signals.

A switch in the console C will generate the AMST and AMSTC signals fed respectively to the transaction processor MRA and the transaction calculator TCA, indicating that they are the masters. The AMST signal is fed also to all the interfaces IF1 to IFN (there being an interface for each TIM) so that scanner SCA will control the sequential and periodic interrogation of the TIMs from TIM 1 to TIM N. The transaction processor MRA will process a transaction, that is, it will check for erroneous transactions and other internally generated errors, and generate storage addresses for the

memory positions in the TIM memory (WM, Fig.1-B), the contents of which are to be updated, and also the addresses of the aggregator registers in the transaction calculator TCA, the contents of which (the aggregated transactions) are to be updated. The transaction information processed from the transaction processor MRA is fed to the transaction calculator TCA. The transaction calculator TCA operates on the processed transaction information to calculate odds, pools, payoffs and similar information.

All units are connected by signal lines which transfer signals between the units. Signal lines bear the same reference characters as the signals on the lines, and this terminology is used interchangeably. Mention of the signal, then, implies the signal line, and vice versa. Furthermore, some signals are shown in a single line for convenience sake, but they are in fact a plurality of lines in a cable. The lines AADR, WADR, MOA, /MIA, SKNA and SKRN are typical examples. Moreover, the lines shown indicate only one polarity of the signal, such as the BID1 signal. However, concurrent with this signal line in some instances a parallel line carries the opposite polarity of the signal, indicated as BID1' (the

prime mark being used to represent a negation often indicated by a bar over each letter being negated).

Switches on the console C determines which side (A or B) is master. Console switches also initially clear the system (by dispatching the ICL signal) through momentarily depressing the "initial clear" switch SIC, and console switches also indicate the entries (horses) upon which no transactions will be allowed ("scratches") by positioning the "non-transaction" switches SKWN which generate the associated non-transaction signals SKRN.

The console also includes a three-position mode switch SFS which, when in the "D" position, indicate the dual mode, when in the "A" position, causes the generation of the FSA signal indicating the simplex mode with "A" the master, and when in the "B" position, generates the FSB signal indicating simplex mode with "B" the master.

The AMST signal fed to the interfaces IF1 ... IFN (and there is an interface for each TIM) sensitizes these units to interrogating signals such as the SCNNA signal from the scanner SCA (see Annex B). The AMST signal fed to the transaction processor MRA insures that storage address signals

are fed only from the transaction processor MRA to register MEMA and TIM memory WM (probably "WM" means "Window Memory," that is, TIM memory). Similarly, the AMSTC signal fed to the transaction calculator TCA insures that only its data are fed to the output line (OUA).

The ICL signal fed to the transaction processor MRA presets to its initial count of one the scan counter SKA, which is a typical chain of conventional cascaded binary counters in which each binary counter has an output both from its "1" and "0" sides, (Annex C, extreme right, lower half of page). The output of scan counter SKA is fed as the SKNA signal from transaction processor MRA to the scanner SCA, which is a typical decoder which decodes the combinations of "1s" and "0s" from scan counter SKA. The SKNA signal is decoded by the scanner SCA and becomes the SCNNA signal which goes only to interface IFN, the interface of TIM N (see Annex B). If TIM N wishes to make a transaction, then one of its transaction keys will have been depressed and BIDN signals will be received by the interface IFN, but will have no effect unless and until the scan is at TIM N for interrogation.

When the scan is ready to interrogate TIM N for the

FPI—SS—3-17-72—30M—9153

wagering transaction, the SCNNA signal passes (via IFN) to TIM N as an SCNN signal, which is fed to the common side of all the transaction-selection switches of TIM N (see Annex B, Annex D). This signal will pass through to the other side of the closed transaction-selection switch and be fed out as a selected-transaction HIN signal to buffer 1A (see Annex B: the 1 in the signal designation HIN and in the buffer designation 1A indicates the horse, or "entry," numbered "1." No matter how many TIMs there are, and the TIMs are thought of as being an indefinitely large set, TIM 1, TIM 2, ... TIM N, all wagers on starting horse No. 1 will feed from the N TIMs to buffer 1, all wagers on horse No. 2 will feed to buffer 2, and so on through the N starting horses; the starting gate capacity sets the maximum number of horses that can contest any race.) For example, if the entry is being inserted as a wager on horse 1 (see Exhibits 11, 14 and 15), entry key 1 of the TIM N would have been depressed, causing the associated transaction-selection switch to close and latch, and an HIN signal would feed through buffer 1A to become the particular entry H1A signal fed to transaction processor MRA (See Annex B). The H1A signal is stored in the

FPI—SS—3-17-72—30M—9153

entry register 1 HRA in the transaction processor MRA (see Annex C).

At the same time, Control KA (see Annex B, C; KA is in the transaction processor MRA) transmits a test-for-transaction-made TFB signal, generated by flip-flop TFBF (Fig.3, upper right), to probe the transaction-made unit BMA (Annex C, lower half). (The lettering signifies "TFB" - test for bet signal; "TFBF" -test for bet flip-flop; and "BMA" - bet made unit. The A indicates, again, the A side of the dual system. The F at the end of TFBF is the indicator of a flip-flop, seen best in Fig. 3 at the right where the large squares, arranged one above the other, are all flip-flops. Similarly, in Annex C, upper half, the bottom row of symbols includes flip-flops ERAF and REJF. In Annex D are seen the flip-flops CONAF and REJAF.) If a transaction has been made, as indicated by the presence of a signal on one (and ideally one only) of the H1A to HNA lines from one of the buffers 1A to NA, a BMD signal is fed back to control KA from BMA to start an error-test routine. If no BMD signal is fed back, control KA generates a STEP signal to scan counter SKA

(Annex C, lower half) which steps to the count of n + 1 to initiate the transaction-interrogation of the next TIM in sequence. Note that the H1A signal (or HNA signal, as the case may be) results from the SCNN signal's passing through a latched transaction switch, and, if this switch was not latched, the STEP signal was generated. Therefore, this is the method for stepping over TIMs which are not ready with a transaction,

If, however, a transaction-selection switch is latched, and, therefore, one of the H1A to HNA signals is present, it causes a BMD signal to go to control KA, and, as noted just above, an error-test routine starts. The presence of the BMD signal at an input of "and" unit A2 (Fig.3, upper right) passes a pulse to the"set to 1" input terminal of flip-flop TFTF ("test-for-two" flip-flop), which generates the TFT signal and simultaneously passes the pulse to the "set to 0" terminal of flip-flop TFBF. The first test of the error-test routine after the test-for-bet-made process step is a two-entry transaction test; that is, a test is made to insure that the signals from entry register 1HRA (Annex C, lower half) indicate that only one entry is stored in it. The error risks are that e.g., TIM N faultily transmitted both H1N and HNN signals

(see Ex. 16) simultaneously (i.e., one $2 wager on two horses in the same race), or that through a failure in the buffers 1A and NA both wagers in a daily-double transaction are transmitted to the first-race entry register, 1HRA (in transaction processor MRA, Annex C). In such case, the two entry transaction test unit THBA (Annex C, lower half) will reply with a THBI (two horses bet input) signal in response to the TFT (test for two) signal from control unit KA (Fig.3). If that is the case, control KA, sets the error flip-flop ERAF (Annex C, upper half) generating the ERA signal and generates the REJA signal (Annex C, Ex. 16A; the TFT and THBI signals reach "and" gate A7; if both are present, they energize the "or" gate 03, which in turn energizes the flip-flop ERAF, which in turn energizes the "or" gate 04, which in turn energizes the flip-flop REJF and the delay unit D4, from which the REJA signal emanates.) The REJA signal results in unlatching the latched transaction-selection key in TIM N, and the ERA signal will make the "message register" MRA ineffective.

If no such error is detected, a THBI' signal is fed to the "set to 0" input of flip-flop TFTF and to the "set to 1" input of flip-flop TFSF, which generates the TFS signal

FPI—SS—3-17-72—30M—9153

(test-for-scratch) to test for the selection of an entry upon which no transaction will be accepted, that is, a "scratch." The signal representing the entry stored in the entry register 1HRA (Annex C, lower half) is fed as one of the 1HRN signals to the test for non-allowed transaction unit TFSA (Annex C) and compared with the non-transaction ("scratch") signal SKRN from console C. The TFS signal from control KA probes the TFSA unit (a conventional equality comparator) for equality between the 1HRN and SKRN signals and, if it exists, causes the return of an SKRI signal to control KA, which generates a REJA signal. It also causes the generation of a STEP signal, fed to scan counter SKA, for stepping the scan to the next TIM.

If no non-allowed transaction is detected, the next error processing step is performed. An SKRI' signal is fed to one input of "and" unit A4 (Fig.3), the output of which is fed to the "set to 0" input of flip-flop TFSF and the "set to 1" input to flip-flop RSCF which generates the RSCNA' signal; this starts the false entry test which insures that the signal on one of the lines H1A to HNA truly resulted from the depressing of an entry key. The signal RSCNA' (meaning

that the entry is real, not false) is fed from the transaction processor MRA to all the interfaces (see Annex D). [The specification clearly, and twice, says that signal RSCNA' (the negation or inversion of RSCNA) is fed from MRA to IF1 to IFN. However, Figure 3 shows the "1" output of RSCF as RSCNA and the "0" output as RSCNA', and Figure 1A as corrected pursuant to correction request allowed October 27, 1965 (Ex.2, p.105) shows the signals from MRA and MRB to IF1 and IFN corrected from the negative to the positive signals RSCNA and RSCNB. Figure 4, however, shows the negation signal ("no false bet") reaching the interfaces IF1 to IFN (at A8 and A9) to generate, with SCNA and the "A" master signal, via "or" gate 05 and "and" gate A10 the SCNN signal to TIM N. The inference is that the drawing Fig.1A should not have been corrected. The text, reading it as saying RSCNA', must be taken to mean that RSCF generates RSCNA' later, from the input to its "0" side, from possibly, CONF via "or" unit 02.] However, since the scan is at TIM N (the SCNNA signal), it passes through the interface IFN, where is terminates the generation of the SCNN signal (see Annex D). It will be recalled that the SCNN signal was the interrogating signal was

which passed through the latched transaction-selection switch causing transmission of signals through buffers 1A to NA to indicate which horse ("entry") a transaction was being made upon. Therefore,none of the lines H1A to HNA should carry a signal when the SCNN signal is absent. After a delay [at D1, Fig.3] to permit the passage of signals through the loop including TIM N, the RSCNA signal (meaning a false bet indication is present in signal form) is fed to the transaction-made unit BMA (Annex C lower half). At this time, if no signals are generated on the lines H1A to HNA, a BMD signal is not generated. If, however, the BMD signal, indicating one of the H1A to HNA signals must be present, is generated, control KA - since this is an error - will receive this signal, which causes the setting of the error flip-flop ERAF and the generation of the ERA and REJA signals in the usual way (See Annex C, upper half of page, at "and" unit A6, indicated in dotted lines).

[Note that the BMD signal just described as occasioning the ERA signal is the BMD signal referred to above as being produced when the TFB signal probed unit BMA. That BMD is fed, in control KA, to "and" unit A2 and the output of unit A2

initiates the set of tests of the BMD signal itself for errors.]

When the transaction processor MRA completes a test routine, it generates a signal indicating this fact. For example, after tests are made for "test for bet made," for "test for two-entry transaction" and for "test for non-allowed transaction," concurrent with the "test for a false-entry transaction," the "test-finished" signal TFA is generated by control KA (Fig. 3, Fig.2, line from KA to SYNA ; in Fig.3 at bottom right the PROA signal to A5 of KA is generated by the coincidence of TFA and TFB signals in SYNA in dual operation)

If an error occurs in the transaction processor MRA, it will be rendered ineffective, it will not generate succeeding test or step-finished signals, but, since it generates an error signal, this signal replaces the test-finished signal (TFA, supra). For example, if transaction processor MRA detected an error, it would "shut down" and generate the ERA signal, as above. The ERA signal would then replace the TFA signal, the test-finished signal, generated by control KA.

After all these error tests have been completed, a GERF

FPI—SS—3-17-72—30M—9153

flip-flop is set (Fig.3, lower right). In particular, the coincidence of the BMD' signal (indicating that there has been no false entry) and the RSCNA signal from the "1" out of flip-flop RSCF, delayed [at D1], as inputs to "and" unit A5 set the GERF flip-flop to "1"; the "1" output of the flip-flop GERF (passing via "and" unit A41 and not via "and" unit A40 since the daily double is not involved) becomes the GERA signal (Fig.3).

The GERA signal "strobes" the storage address generator SAGA (Annex C, lower half, dotted line). The storage address generator SAGA is a plurality of "and" units each having one of its inputs connected to the GERA signal line and other inputs connected to various combinations of the 1HR1 to 1HRN and DKN signal lines from decoder DEC (Annex C, lower half).

The storage address register SAGA, in response to the GERA signal, transmits two groups of signals. The first group AADRA1 to AADRAM is associated with entry transactions; the second group, AADRAM+1 to AADRAN, is associated with the TIMs. These signals are grouped into a cable generalized as an AADRA signal (Annex C, lower half).

The control KA generates the "send address" signals

SADD (Fig.2,3). The SADD signal is received by the aggregator address transmitter AATA and TIM address transmitter WATA (Fig. 2). The first and second groups of the storage address signals AADRA pass through the aggregator address transmitter AATA to become the aggregator AADR signals; likewise, the second group of AADRA signals passes through the TIM address transmitter WATA to become the memory position address WADR signals (Fig.2). Since single wagers, and not daily double wagers, are here considered, only the 1HR1 to 1HRN signals and the DKN signals (from the entry register 1HRA and the decoder DEC) will be included in the AADRA signals. In the simplex mode, with transaction calculator TCA operating, the AADR signal (from the aggregator address transmitter AATA) is fed to the registers MEMA. Registers MEMA include a multiplane magnetic core matrix which is divided into rows and columns wherein the core in each plane in the same row and column provides a bit storage for a multibit binary number. A group of the registers (aggregator registers) is reserved for aggregating transactions. Other registers are reserved for storing operation and result information of the computer COMA. Included with the registers

FPI—SS—3-17-72—30M—9153

are typical row and column "selectors" as well as "read" and "write" amplifiers. Each row of matrix associated with the aggregator registers may be assigned to a different entry (i.e., horse), and each column, to a different TIM (see Col. 13,11 1-14). The addressing circuitry in register MEMA receives the aggregator address signals AADR to select the indicated aggregator register. The contents of that selected aggregator address are "read" out, re-circulated, and "written" back into the same selected aggregator register to update the number of wagering transactions. In particular - for example - the AADR signals when received by the aggregator registers of registers MEMA select the column associated with the TIM and the row associated with the particular entry (i.e., horse) upon which a wager is being made. The signals representing the accumulated number of transactions in that aggregator register are "read" out via the MOA (i.e., memory output) signal lines to the updater UAA, where the count they represent is updated by one, and are then fed back via the MIA (i.e., memory input) lines to the original register in registers MEMA. At this time, registers MEMA feed an acknowledgment signal, ACKA, via amplifier AKA, to the control KA,

indicating that the transaction has been recorded.

As what has just been related implies, the AADR signal lines are a plurality of lines, divided into two groups. The first group is made up of lines associated with the outputs indicative of wagers made on particular entries (horses), and the lines are coupled respectively to rows in the registers MEMA. The second group is made up of a plurality of lines associated with the TIMs being processed. Under control of a "read" signal the "bits" of the number will be read out of the selected aggregated register as signals on the sense windings connected to the MOA signal lines, passed through a means for updating (e.g., updater UAA) and returned to the same selected aggregator register under control of a "write" signal (such recirculation type magnetic matrices are well known.) (Col.13, ll.14-22, 27-33.)

The ACKA signal, fed from registers MEMA via amplifier AKA, passes through "or" unit 045 in the control KA Annex C, upper half) to set the CONF flip-flop to the "1" state. The "1" output of the CONF flip-flop passes through "or" unit 02 to the "set to 0" input of the RSCF flip-flop, which, again, generates the RSCNA' signal, which is fed to the interface IFN to regenerate the SCNN signal (see Annex D).

Although the SCNN signal causes an entry to be accepted by entry register 1HRA as described above pp.92-93, since this is the same entry as before, it makes no difference. The "1" output of the CONF flip-flop also passes through the delay unit D3 to become the CONA signal. The CONA signal is fed to interface IFN, and there, via "and" unit A90, "or" unit 090 and "and" unit A61, to the "set to 1" input of the CONAF flip-flop (Annex D). The CON signal is then taken directly from the "1" output of the CONA flip-flop in interface IFN, as shown in Annex D. (The "and" unit A80 and delay unit D7 relate to daily double betting; they do not function in regular betting.) The CON signal is fed to the TIM under scan, TIM N, causing the unlatching of the depressed switches and the issuing of the ticket receipt.

The CONA signal also passes through "or" unit 01, (Annex C, upper half) to trigger the step pulse generator STP (which is a conventional delay multivibrator) to generate the STEP signal which, accordingly, occurs after the CONA signal. Therefore, the scan counter SKA is incremented by one so that the next TIM may be interrogated. When the scan steps off TIM N, the BIDN signal terminates, causing the generation of

the BIDN' signal which is connected to the "set to 0" inputs of the flip-flops CONAF and REJAF (Annex D).

The step signal STEP clears the entry register 1HRA (Annex C lower half) as well as setting the TFBF flip-flop to its "1" state, and the three flip-flops CONF, and REJF, and GERF to their "0" states (Annex C, upper half and Fig.3).

While the entry transaction is being aggregated (see discussion of MEMA registers,pp.101-102above) the specific TIM transaction is also aggregated. In particular, the WADR signal is fed to TIM memory WM. The TIM memory WM is a multiplane magnetic core matrix and associated units similar to the registers MEMA, except that its matrix may be considered as having a single row. Of course, it can have many rows, each associated with different entries. The specific addressed memory position in the TIM memory WM is selected in the manner described above for the registers MEMA; the contents of that addressed memory position are "read" out on the WO signal lines and fed via the updater UAW and the WI signal lines back to the same addressed memory position in the TIM memory WM. In this way, a central check is maintained on the number of transactions made at each TIM.

FPI—SS—3-17-72—30M—9153

The transaction processor MRA continues in this manner to interrogate sequentially each TIM and to process any wagering transactions that are made. Finally, the scan counter SKA reaches a count that is one greater than the number of TIMs. Therefore, no TIM is interrogated on this step. Instead, the reliability of the buffers 1A to NA is tested for short circuit conditions which would effectively prevent transactions on certain entries during certain periods of time. For example, if an element in buffer NA associated with the line HNN is short-circuited, and the entry number N key of TIM N is depressed while the scanner SCA is pointing to another of the TIMs, then that other TIM will be unable to complete a transaction on entry N.

The test is performed by transmitting the CHKA signal, derived from the SCNZA signal generated by scanner SCA, to each of the buffers, NA. For simplicity,

CHKA = SCNZA.

The buffers 1A to NA should each transmit a simulated transaction on each entry: that is, signals should be present in all of the lines H1A to HNA. Those lines are all fed to the

end-scan test ESTA (Fig.2) and a multicoincidence is tested for by the SCNZA signal. If the multicoincidence is not obtained, an ESR signal is fed to the control KA (Annex C, upper half, dotted line to 03), causing the generation of the ERA error signal (Annex C). That signal is derived from the flip-flop ERAF at its "1" output, as seen in Annex C.

During all the time until the race commences, the computer COMA periodically performs calculations on the aggregated transactions in order to establish interim accounting results such as odds (Annex B, dotted lines). The computer has access to the aggregator registers which supply the operands." Error checking is performed during these calculations. If an error is detected by the transaction calculator TCA (Annex B), it generates an error signal. The transaction calculator will become ineffective and cause error unit ERCA to generate a CERA signal. The disposition of the CERA signal relates to dual operation and is not involved in simplex operation. If there is no calculator error, then when an output is desired, the transaction calculator TCA transmits the result information to the output units, OU (Fig.1-B).

FPI—SS—3-17-72—30M—9153

Returning to the cases of detected error: the error flip-flop ERAF (Fig.3) is set to "1" if there is any one of the following signals (for the signal to ERAF's "1" input is derived from "or" gate 03): (a) if there is a false-entry error indicated by the coincidence of the RSCNA and BMD signals at inputs of "and" unit A6; (b) if there is a two-entry error indicated by the coincidence of the TFT and THBI signals at inputs of the "and" unit A7 (Fig.3); (c) if there is a short circuit in one of the buffers NA, as indicated by the ESR signal from the end-scan test unit ESTA to control KA at "or" knit 03 (Fig.2, top, Fig.3, lower left); (d) if there is an inequality error indication, the ERD signal, from inequality tester DU1 (Fig.1A, bottom) - not applicable to simplex operation, or (e) if there is an FSB signal which is received by transaction precision MRA at control KA from console C, indicating that only the B side is operative - not applicable where the system is operating simplex. The outputs of "and" units A6 and A7 and the FSB, ESR and ERD signals feed inputs of "or" unit 03, the output of which is connected to the "set to 1" input of error flip-flop ERAF. The setting to "1" at any time of the error flip-flop ERAF (which

occurs if any one or more of the five signals is present) causes the transaction processor MRA to become ineffective, that is, to drop out. The ERA signal is sent from control KA to console C, which will terminate the generation of the AMST signal.

The ERA' signal, which is the "0" output of the ERAF flip-flop,is fed to an input of "and" unit A41 to prevent the generation of GERA signal so that no storage address will be generated by the storage address generator SAGA. [Quaere: A41 is an "and" gate, and the presence at it of a signal seems unlikely to inhibit output. See e.g., Col.7 1.6 where the presence of DD1 (also a negation or inversion signal) at "and" gate A41 causes the "1" output of GERF to become the GERA signal. Is the sentence properly, "The"0" output of the ERAF flip-flop ERA' is not fed to an input of "and" unit A41 to prevent the generation of a GERA signal etc."? The signal under discussion is ERA which cannot coexist with ERA'.] The ERA signal, however, will pass through "or" unit 04 to the "set to 1" input of the REJF flip-flop to initiate a reject routine.

FPI—SS—3-17-72—30M—9153

The REJA signal is related to the REJF flip-flop. That flip-flop is set to "1" whenever the non-allowed transaction signal SKRI or the error signal ERA is generated (Annex C). The ERA signal and the SKRI signal are fed via "or" unit 04 to the "set to 1" input of the REJF flip-flop. The "1" output of flip-flop REJF is fed via "or" unit 02 to the "set to 0" input of the RSCF flip-flop causing the generation of the RSCN' signal, which is fed to "and" unit A8 in interface IFN (Annex D). This signal will pass via "and" unit A8 and "or" unit 05 to become one input of "and" unit A62. The "1" output of REJF flip-flop also passes through delay unit D4 to become the REJA signal (Annex C, top half) which is also fed to interface IFN. Signal REJA passes via "and" unit A92 and "or" unit 091 (Annex D) to become the second input of "and" unit A62, the output of which is connected to the "set to 1" input of the REJAF flip-flop, causing the generation of the REJ signal which is fed to TIM N to unlatch the latched switch. The output of "or" unit 091 fed to "or" unit 06 may be ignored since related wholly to daily double wagering.

The STEP signal is generated if there is no error and if no CONA signal has been generated as a result of the valid

FPI—SS—3-17-72—30M—9153

processing of a wagering transaction resulting in the issuance of a ticket receipt. If no transaction is sensed, or if a non-allowed transaction is sensed, it is necessary to "step" to the next TIM without further processing. The first case (no bet made) is indicated by the presence of the BMD' and TFB signals at inputs of the "and" unit A1, the output of which feeds "or" unit 01 (Annex C upper left). The second case (wherein a non-allowed transaction is sensed) is indicated by the presence of SKRI signal at a second input of the same "or" unit 01. The output of "or" unit 01, when it transmits a signal in response to a signal received at any one or more of its inputs, will cause step-pulse generator STP (Annex C,top center) to generate a STEP signal in the usual manner, and that signal will function as described above.

Scanning is electronically performed at high speed, whereas the TIMs are electromechanical and comparatively low-speed. To assure use of the high-speed scanning rates the scanner SCA does not wait until the TIM selection-switches unlatch and the TIM prints out the ticket before stepping, but, instead, it steps immediately after initiating these operations. Accordingly, the scanner might return to such a

FPI—SS—3-17-72—30M—9153

TIM before the unlatching is complete. Therefore, if no provision is made for such a case, a new transaction will start. To prevent such an error the system provides that so long as a transaction selection switch is latched, the BIDN and BIDN' signals are generated. As described above, for the scan to step, at least one of the CONAF or REJAF flip-flops must be in the "1" state (Annex D). Therefore, when the SCNNA signal is generated, it passes through "or" unit 05 to one input of "and" unit A10, the other two inputs of which are connected, respectively, to the "0" outputs of the CONAF and REJAF flip-flops. Hence, if <u>either</u> flip-flop is set to "1" (rather than "0"), then "and" unit A10 will not pass an SCNN signal (since the "and" unit A10 requires the coincidence of signals from the 0 outputs of flip-flops CONAF and REJAF with a signal from "or" gate 05 to pass the signal SCNN forward), and, accordingly, no interrogating signal is generated. No signals will, then, be on any of the lines H1A to HNA, the "transaction-made" unit BMA, when tested as described above, will <u>not</u> send back a BMD (bet made) signal to control KA, and that control will, in consequence, immediately generate a STEP signal, moving the scan to the next TIM in

order. Thus the fast moving scanner can pass the slow-operating TIMs without registering erroneous duplications of the transaction underway at the TIM. When, however, the transaction switch finally unlatches, the BIDN' signal sets the CONAF or REJAF flip-flop (whichever of them was set to "1" because of a "reject" or "confirm" signal) to the "0" state. The next time the scan reaches the TIM an interrogation will be performed.

TIM N, and other regular betting TIMs, may be of the type which includes a bank of entry keys, each associated with a different entry. Each key when depressed closes a transaction selection switch which latches. Each switch is, effectively, of the single pole, single-throw type, having a moving contact electrically connected to a common-input line, and a fixed contact connected to a selected output line, such as line H1N or HNN. The common input line is the SCNN signal line. Ganged to all these switches is a bid switch which generates BIDN and BIDN' signals as long as any transaction selection switch is latched. Included in the TIM is an electromechanical ticket issuing and printing mechanism which

is energized by the confirming CON signal to print and issue a ticket and unlatch any transaction selection switches. There is also an electromechanical means for unlatching the switches upon receipt of a reject REJ signal.

Typical buffers 1A and NA are "or" units which will, therefore, pass a signal to the entry register 1HRA in transaction processor MRA, if any, some or all of the TIMs have a valid wagering transaction on the horse whose buffer it is (or if a simulated transaction (CHKA) is present as part of the end-scan test Col.9, lines 8 and following). That is the verbal translation of the Boolean expression of Column 11, line 70.

As noted above, each scan counter (one for the A side and one for the B side when working in duplex mode) typified by SKA, is a chain of conventional cascaded binary counters wherein each binary counter has an output from both its "1" and "0" sides. That is, the binary counter is made up basically of a set, which may be indefinitely large, of flip-flops, each flip-flop being, obviously, able to represent either a 1 or a 0, and to represent it until a new impulse changes it from "1" to "0" or from "0" to "1." Each flip-flop, then,

FPI—SS—3-17-72—30M—8153

represents a number place from the extreme right at the decimal/indefinitely leftward. If the counter is to function, it must, when set to "1" and in receipt of a signal to add "1," flip-flop to a "0", and carry its original "1" entry to the next flip-flop to its (notional) left. If each of a series of flip-flops extending leftward turned out to be already at the "1" state, the "carry" would go on from flip-flop to flip-flop until it reached a flip-flop that was set to "0", and there the "carried" "1" would come to rest expressing the binary number "1" followed by a series of zeroes ending with the decimal divider. (See Exhibit L and Exhibit 1, column 11, lines 73, 74, column 12, lines 1 to 7.)

The typical scanner SCA is a decoder, which decodes the combinations of "1"s and "0"s from the scan counter SKA. The role of the scan counter SKA is to identify the TIM under scan at any moment of time by its sequential number; a role of the scanner is to decode the binary number in the flip-flop array of the SKA scan counter. The decoded signal from SKA becomes the scan signal SCNNA which, as explained above, goes to the interface and thence, as the signal SCNN, to the

PPI—SS—3-17-72—30M—9153

TIM under scan, TIMN; there, via the common side of the transaction-selection switches, it reaches the depressed key for the wager being made, and feeds out of TIM N as the appropriate selected-transaction signal, such, for example, as HIN, to a buffer, such as Buffer 1A. The decoder function of the scanner SCA is illustrated in Exhibit M, Figure 3-3(a); essentially that figure depicts a bank of "and" gates wherein each "and" gate is designed to gate only one combination of binary bits.

The console C performs miscellaneous central control functions in the main manually actuated. Here the scratch switches are located which enable the controller at the console to communicate the scratches electrically to each window, so that the TIMs at that window can be deactivated in some way with respect to the scratched horses or simply be put in a state of caution with respect to them. This is done by imposing a scratch signal on the appropriate lines of the SKR1 to SKRN signal line cable. In addition the console has the starting switch or "initial clear" switch which generates an ICL signal to clear the control elements and to set the scan counter SKA to a start count. The console also has a

FPI—SS—3-17-72—30M—9153

three position mode switch SFS with three positions D, A and B indicating setting the system to dual mode operation, or setting the system to the simplex mode with either A as the master or with B as the master.

The "means" relating to the unit marked AKA in Annex B lower half, which generates the ACKA signal, is described, column 13, lines 43-44 (and see column 8, lines 9-21) as satisfying a Boolean equation which states that a signal directing that a new total number of wagers on any one of the horses (increased by "1" from the previous total) be restored to the same address from which it was "read out" in the aggregator registers MEMA will cause an "acknowledge" signal to be dispatched to transaction processor MRA.

All the updating means, such as updater UAA (Exhibit B, lower half, lower left corner) and updater UAW (Annex B, lower half, upper right) are "unit adders," similar to each other and of which many were available in the art of 1963. For example, the binary adder shown in Exhibit N in Figure 4-1 (page 84) with slight modification can serve the purpose. That figure depicts a binary "half-adder" system; and the

FPI—SS—3-17-72—30M—9153

"modification" is to use the number "1" (binary) as a constant addend, thus making the adder specifically a "unit adder" operating to increment by "1" in each operation.

The computer COMA is described as an internally programmed general purpose computer which can perform the necessary arithmetic operations, such as odds computations on the aggregated transactions to produce result information, such as pay-offs. The computer also generates addresses to select the aggregator registers (in MEMA) in addition to its own registers.

Output units take the form of visual display boards, line printers, magnetic tape units, etc.

The transaction processor MRA includes the elements shown in Figure 2 including the control KA, principal details of which are shown in Figure 3 (both shown on Annex C). The entry register lHRA can be a plurality of flip-flops like those described above. The left hand input of each flip-flop is connected to the STEP signal line seen entering at the right side of the entry register. The right hand input of each flip-flop is connected to one particular transaction signal

FPI—SS—3-17-72—30M—9153

line, e.g., HNA. The "1" output of each flip-flop is connected to one of the 1HR1 ... 1HRN signal lines. The "0" output of each flip-flop is connected to one of the 1HR1' ... 1HRN' signal lines. The entry register is in effect a set each member of which is a storage place for a single entry and is, in substance, a short-term memory, that being a function that can be served by flip-flops because of their bi-stable characteristic.

The end scan test unit ESTA is a logical element which tests for the multi-coincidence of the simulated transaction signals on each entry line (supra). The Boolean equation as given says that if the simulated signal for every entry key and the test signal are present, then an ESR signal is in order, which would generate an ERA signal. [The Boolean equation calls for the ESR signal when the coincidence is present, but this seems incompatible with column 9, lines 8 to 18; perhaps the right side of the equation should be ESR'.]

The transaction made unit BMA is again a logical element satisfying a Boolean equation calling for the coincidence in the unit, of (a) a wager on one of the entrants in the race

FPI—SS—3-17-72—30M—9153

and (b) either the test-for-bet-made signal or the test-for-false entry-signal in order to produce a BMD (bet made) signal. The counter signal, BMD', is produced by feeding the BMD signal to an inverter.

The "test for non-transaction" unit TFSA is a conventional equality comparator which, when strobed by the TFS signal, will transmit an SKRI signal if an equality exists. Such a comparator could be a logical element satisfying a Boolean equation signifying that if in the unit there coincide a scratch signal from the console on a particular horse and a signal from the entry register of a wager placed on the scratched horse, and the test-for-scratch signal is also present, then the scratch input signal SKRI is generated and becomes an input to "or" gate 01 in control KA. The SKRI signal is fed to an inverter to generate the SKRI' signal. [The SKRI signal is also fed to "or" gate 04 in the control KA.]

The "two entry transaction" unit THBA can be a conventional" majority logical element" which will transmit a THBI signal when interrogated by a TFT signal if at least two of

the 1HR1 ... 1HRN signals are coincidentally present. Alternatively a logical element can be employed that would satisfy a Boolean equation stating that if both the TFT signal and signals indicating simultaneous wagers at the same TIM on two different horses entered in the same race coincide in the THBA unit, then the THBI signal will be generated. The two-horses-bet input signal (THBI) then goes to "and" unit A7 in control KA, where, with the TFT signal, it generates one of the signals which can lead to the generation of the ERA signal. (The Boolean equation at column 14 lines 52-55 is misprinted. It is typed correctly in the file history Exhibit 2, 735). The THBI signal is fed to an inverter to generate the THBI' signal.

The storage address generator SAGA, which, as described above, generates a group of signals AADRA1 ... AADRAM associated with entry (horse) wagering transactions and a second group of signals, AADRAM+1 ... AADRAN, associated with the TIMs, functions, as expressed in the Boolean equations of column 14, lines 65 and following, to produce the AADRA signals associated with the entry transactions (annex C, lower half), if the GERA signal and the signal for a wager on a horse are both at the

storage address generator together; and it then functions to produce the TIM signal group of AADRA signals if there coincide at the storage address generator the GERA signal and the appropriate DKN signal from the decoder, and, therefore, from the scan counter (See Annex C). The decoder DEC is, as its name implies, a decoder similar to the scanner SCA, which likewise decodes scan counter signals.

The aggregator address transmitter AATA is adapted to transmit the two groups of signals to the next stage, that is, it generates the individual AADR signals, as the Boolean equations indicate, if there is the coincidence of the relevant signal from the storage address generator and the "send address" signal SADD derived in the control KA from the coincidence of the delay GERA signal and the negation of the ERD signal as seen in annex C upper half, lower right hand corner. The Boolean equation states that the AADR signals will be generated by the aggregator address transmitter AATA if either or both of the A and the B sides of the dual system are functioning. The TIM address transmitter WATA functions in exactly the same way to produce the WADR signals, as shown in the Boolean equations at column 15, lines 15 and following.

It will be evident from what has already been said that the specification was drawn from the First Tote and reflects its electronic makeup. Nevertheless, the language, except in odd places, does not specify or necessarily imply the use of electronic components, and its insistence throughout on generalized expressions that could apply indifferently to electromechanical, vacuum and gas tube, or solid state circuitry precludes a reading of the specification as limited to and selectively invoking specifically electronic means and, within that classification, solid-state electronic means. However, in column 13 the description of the important registers MEMA and TIM memory WM as "multiplane magnetic core matrix" elements, as well as the description of the computer COMA can be thought of as specifically electronic and impliedly solid state electronic devices, and, as pointed out during the trial, column 10, line 72, specifically indicates the use of electronic scanning of the TIMs.

Nevertheless, the descriptive portion of the specification preceding the claims concludes with the typical expression:

> " While only one embodiment of the invention has been shown and described in detail, it will now be apparent to those skilled in the art that many modifications and variations may be made which do not depart from the appended claims."

FPI--SS—3-17-72--30M—9153

35 U.S.C. 112 requires no more of the inventor than that he "shall set forth the best mode contemplated by the inventor of carrying out his invention." It is certainly clear that the language of the specification can supply saving specificity to an otherwise too general claim (United States v. Adams, 1966, 383 U.S.39, 48-49; Singer Mfg. Co. v. Cramer, 1904,192 U.S. 265, 284-285), but the claims here in question evince a determined breadth and freedom from limitation which seem to indicate that the position of the applicant for the patent was that, since this device was apparently the first completely or substantially completely electronic totalizator and was also a solid state electronic totalizator, the claims should be drafted in broad language so that the fullest range of equivalents could be claimed. The point in any case turns out not to be very important, since the deficiency in patentability is not remedied even if the claims are regarded as limited very closely to the specific device described in the specification and are considered as claiming a solid state electronic device rather than (or as an improvement over) an electromechanical or mechanical device.

Before discussing the claims of the patent in issue, the history of the prosecution of the application must be

FPI—SS—3-17-72—30M—0153

referred to. The application was received in the Patent Office on March 28, 1963 and the filing was followed by a petition for special examination which reached the Patent Office on June 5, 1963. The ground of application was that to file an application in extenso would take up to six months and there was a risk that, if the application as filed were found insufficient in its disclosure to comply with the requirements of Section 112, and it took at least six months to prepare a detailed logical and schematic description for filing as a continuation-in-part, the statutory bar might meanwhile have passed, since "the first system which is the subject of the present application was sold on March 31,1963."

The first office action on the application was mailed August 15, 1963 and it recites that the application had been taken out of turn for examination in accordance with the applicant's petition "for the purpose of determining adequacy of disclosure." The Examiner then stated that the disclosure was found adequate to support the claimed subject matter and that the application would not be made special for any other purpose than the making of that determination. It was also

stated that the application had not been examined to the extent necessary to discover all minor errors.

The references cited by the Examiner were six United States patents; certain pages from the British patent on Univac; the publication entitled Functional Description of the EDVAC; the Chao publication, The System Organization of MOBIDIC; and the Gass publication, Project Mercury Real-Time Computational and Data Flow System. These are in evidence as Exhibits 3 through 3-I.

All claims were rejected. Claims 1 through 19 and 29 and 30 were rejected as vague and indefinite. The Examiner continued:

> "The claims are ... vague and indefinite in that they recite, at numerous locations, means for performing a plurality of functions, but fail to recite sufficient structure for performing said functions."

The Examiner then rejected Claims 1 through 5, 9, 10, 14, 15, 17, and 18 as fully met by the Chao (MOBIDIC) publication which incorporated one of the six cited patents, Terzian No. 3,061,192. Said the Examiner:

> "The reference [Chao] shows a data processing system which includes a plurality of pairs of

> units which may be programmed to; simultaneously process the same problem on both pairs of units (thus duplicating the computation); check for errors in each unit; and allow the non-erroneous unit to predominate."

None of the claims just referred to is involved in the present suit.

With respect to all of the claims, the Examiner said:

> "Claims 1-33, as understood, are further rejected as unpatentable over the Chao publication in view of Schrimpf [U.S.Patent No. 3,029,414] and the British patent [No. 749,836, pages 84-92 and 271-276]. It would appear that applicants have done no more than to select a plurality of individual features from the prior art such as duplexing of equipment as shown by Chao, sequentially scanning a plurality of peripheral devices as shown by Schrimpf, and various error checking features as shown by the British patent, and have incorporated them into a unitary data processing system. Said system, even though an improved one for the desired use, is not unobvious to one of ordinary skill in the date processing art."

Claim 34, the only remaining claim in the original application was rejected as plainly non-statutory, and apparently it is quite agreed that the rejection was correct, although unimportant.

The applicant's response was received in the Patent Office

FPI—SS—3-17-72—30M—0153

on December 10, 1963, and it was the sole response except for two essentially supplemental communications received in the Patent Office June 3, 1964, making certain additional corrections in the text of the specification and in the drawings. The response was made up of Amendment "A," which presented very modest amendments in the specification and in claims other than those now in suit, and a "Remarks" section which responded to the action of the Examiner. The Examiner's objection with respect to Claims 1 through 19, 29 and 30 - that the claims were vague and indefinite both in certainty of reference and in reciting at numerous locations "means for performing a plurality of functions" without reciting "sufficient structure for performing said functions" - the applicants answered by quoting so much of Section 112 as provides that "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure" and by reciting the requirement that the claims particularly point out and distinctly claim the subject matter which the applicant regards as his invention. The applicants pointed to Claim 1 of the patent application which, as amended, read:

FPI—SS—3-17-72—30M—9153

"1. A data processor for processing transaction signals comprising:

(A) a plurality of pairs of units, each unit of each pair performing the same function as the other unit but with one operating as a master unit and the other as a slave unit,

(B) a master selecting means for selecting which unit of each pair of units is a master and which is a slave and for changing the selection upon receipt of an erroneous-transaction indicating signal only from the selected master unit, and

(C) checking means responsive to transaction signals being processed in each unit of a pair of units for checking for erroneous transaction signals and for transmitting an erroneous-transaction indicating signal to said master selecting means so that if the master unit caused said erroneous-transaction signal, said master selecting means then selects the slave unit to be the master unit."

The applicants then referred (as had the examiner) to the language in element (C) of the claim which refers to " ... checking means ... for checking ... and for transmitting ..." and then continued the argument in this language:

> "In other words, the checking means performs the function A and B wherein the function A and B comprises subfunction A and subfunction B. Clearly, this is 'a means for performing a specified function' and falls within 35 U.S.C. 112. The alternative approach would be to

FPI--SS—3-17-72—30M—9153

> amend the element to read 'checking means ... for checking ... and transmitting means responsive to said checking means for transmitting ... when said checking means detects an ...' It is believed that such an approach would clutter the claims with unnecessary verbiage and would not particularly point out and distinctly claim the invention."

There was no further discussion of the Examiner's objection.

The response did not direct the Examiner's attention to any place in the specification ~~XX~~ which particularized the structure, material or acts which the means language invoked. Presumably, it would be the whole of the error detection circuitry described, together with the circuitry for determining whether the error was common to both sides of the system, or to one only, and the means for changing master. The patent specification is, however, essentially written in terms of logical functions and not in terms of "structure, material, or acts described," even in the "Description of the Elements of the System" section starting in Column 11. In a word, the specification does not advise a licensee what "means" components or elements he should order from a manufacturer or include in his bill of materials in order to put together the

"means" referred to. The response did not meet the Examiner's point, but rather turned it aside with a semantic parry ~~XXX~~ not addressed to whatever substance was in the criticism.

The applicant discussed the Chao article on MOBIDIC strictly in terms of MOBODIC viewed as presenting a duplex or dual system. It may be noted that the discussion portion of the MOBIDIC paper (Exhibit 3-H, pages 106, 107) suggests that the applicants erred in saying that the MOBIDIC system did not operate simultaneously on the same data, and did not compare the output of the two processors and error detection means. The deeper inadequacy of the applicants' response to the examiner's discussion of the Chao article on MOBIDIC is that it discusses only the duplexing aspect of MOBIDIC and of the somewhat related Terzian patent (No. 3,061,192). None of the claims directly in suit is on the dual or duplexing operation of the device of the patent.

The Examiner's reference to the Schrimpf patent (No. 3,029,414, Exhibit 3A) is answered by saying that the Schrimpf patent merely showed "a single scanning means for scanning a plurality of input-output devices which, when it

FPI—SS—3-17-72—30M—9153

finds a demand at a particular input-output device, sets the computer into a subroutine which then ties up the computer to store information in the main memory." Schrimpf, it is argued, was not remotely concerned with the interactions of TIMs and computers, wherein, in addition to scanning, there is direct control of the TIM reaction, that is, whether to issue a ticket or reject the transaction. It is argued, too, that Schrimpf does not prevent duplicate entries of the same transaction (because of the slow operating input device) and does not remotely suggest handling multi-entry transactions. Certainly it is plain that Schrimpf does not anticipate Weida, but that was not the Examiner's point in citing it. The Examiner instanded Schrimpf's sequential scanning of a plurality of peripheral devices, and so much Schrimpf does, indeed, opulently teach, specifying demand lines that indicate when a particular peripheral device is in condition to receive or transmit information and a responsive scan signal in the form of an operational control signal generated by a traffic control circuit for purposes of initiating a control operation directly related to the demand line from the peripheral device which is then active. In addition Schrimpf specifies a second and separate system of scanning (traffic control

circuit identified by the numeral 12) which sequentially scans a separate set of demand lines, the sequence register demand lines. The purpose of the second scanning is to supply a traffic control system for sequencing a plurality of programs, since it is visualized that the peripheral devices may be demanding execution of different programs. Schrimpf does provide error detection means (as seen from Fig. 2B). The indication is that the error signal would be generated if an error occurred in the course of performing an order called out by any one of the sequence register selection signals.

The response similarly differentiates the British patent, referred to by the Examiner for its display of various error checking features, by observing that under the British patent error detection stops the computer, whereas in the system of the patent error detection requires switching to the second circuit, thus minimizing the possibility of stopping the computer entirely. But again the Examiner's point was not that the British patent anticipated Weida or any of the particular subsystems within Weida on which claims were based, but that the British patent showed various error detection features, which it undeniably does. The British

patent refers to duplicating circuits in order to check on arithmetic operations without interrupting computation; it performs the computation simultaneously but independently in separate units, and compares the answers of the two circuits for discrepancies indicative of error through a half-adder called a like-unlike or comparison checker. The British patent also indicates that most of the important system units are duplicated, and that there are eight comparison checkers throughout the computer, so located that every arithmetic or transfer operation is checked by a comparison checker (see Ex. F, pp. 84, 86 second column, 87 second column, and 271 first column).

The applicants' principal argument, of course, was to point out that merely finding features of the claimed invention scattered among different references in the prior art is not significant unless the references "suggest the combination" presented by the applicants' claimed invention; it is argued that the references of the Examiner do not suggest(in Chao's case) the parallel operating and switching concepts claimed by applicants nor does Schrimpf teach the

"inventive concepts concerned with the interaction of the input machines and the remainder of the system," nor does Chao suggest adding a scanner and a plurality of ticket issuing machines to his computer system or solving the problems created thereby - the problems dealt with in the applicants' device. But, although it is true that a combination patent is never invalid simply because no one of the elements of the combination is itself separately patentable, it is equally a truism that the fact that the combination cannot be shown to have existed earlier does not establish patentable utility and novelty. What is old always suggests a range of uses that is a function of the essential nature and attributes of the article and method. Its suggestiveness is not confined to the known instances of past use. The combination must be unobvious. It must do something more than or different from what any linkage of the separate elements would, from their very nature, accomplish. In other words, the combination claim must be not simply unobviously new but, in the language of the Court, must have something approximating a synergistic effect. Anderson's-Black Rock Inc. v. Pavement Salvage Co., Inc., 1969, 396

U.S. 57, 59-61.

The patent prosecution really went no farther. There was no interview, no further submission, other than the corrections referred to above. The patent and all 33 of the claims, with the modest corrections made in some of them, were then allowed. The claims presently involved, Claims 20 through 27 were allowed without amendment, exactly as filed.

No doubt the patent office's task of going through applications for patents on elaborated data processing systens is a daunting one; invention is likely to lurk in some special aspect of the system or device not easy to isolate in the necessary welter of detailed circuitry inevitably presented. But it is difficult to escape the conclusion that in the present case the examination of the patent application was perfunctory, and the allowance of the claims necessarily of dilute, if of any, significance beyond that commanded by the statute. The applicants rested on merely differentiating what was cited to them. they never affirmatively identified their new, useful and unobvious advance over the prior art as distinguished from merely pointing out differences in detail between their device and those of the prior art.

FPI—SS—3-17-72—30M—0153

If anything, the prosecution, as far as it was carried, indicated that there could well be some patentable subject matter present without in the least relating that broad possibility to any of the particular inventions claimed in the 33 claims that were allowed, and, specifically, without relating that possibility to the claims here in direct controversy.

V

The nature of the claims of the patent and, indeed, the patent as a whole are best understood in terms of the nature of the task to which the device of the patent was addressed. While the patent is not, of course, restricted to parimutuel betting atrace tracks using TIMs with numbered keys that are depressed to register a bet and which issue betting tickets automatically, the system of the patent is hardly a general purpose system. Its utility would necessarily be limited to counting situations fairly close in kind to that at race tracks. The role of the computer COMA, which, as it happens, is not involved in any of the claims in question, is not integral in any very substantial sense to the system elaborately described in the specification. The system of the patent

is primarily an aggregator system, aggregating the number of wagers placed on each entry in the race in two separate aggregators, the registers MEMA which aggregate the wagers on each horse in the race in each of the three pools (i.e., win, place and show) and the TIM aggregator (the TIM memory WM), where the number of wagers made at each TIM on each horse in each of the three pools is separately aggregated. These are kept up to date, as each additional wager is signalled, by the updater, which, in each case, is a unit adder; that is, it adds one. The task, then, is a very simple one, and it is the same for every race every day. There is no general purpose problem here calling for complex programs, and programs that must be altered from moment to moment or from day to day. Rather, the task is one that calls for a simple, stable system emphasizing high reliability and speed. The computer, too, has, as computer tasks go, a very simple job, and that is to draw from the aggregator MEMA the total wagers in each of the three pools and the total wagers on each horse in each pool, to use these sums to compute the odds on each horse in each pool and the total wagered in each pool, and then to feed to the output display boards the

result of the odds computation on each horse in each pool and the total bet. This the computer was to do each 70 seconds, and it had to have within it sufficient stored programming so that it could reach each register in the aggregator in order to read out the data in it for use in the computation. Such a task is without any inherent difficulty, and it involved no great degree of solid-state electronic data processing art. The whole Raceway task, when outlined to Mr. Leonard by Mr. Lynch at the very beginning of the project in 1959, seems not to have been thought to present any particular problem. There was no delay in Mr. Leonard's presenting confidently a system that would deal with the matter effectively.

Even a simple task involves a good deal of detailed circuitry. That is the present case. Perhaps Annex A will help in the visualization. This very untechnical sketch eliminates much of the wiring but does show the elements directly involved in the system of the patent. Very roughly the boxes at the left from TIM N at the top to the output units at the bottom show the flow of input data from the TIM to the display boards. Very simply, the task is to get the wagers placed at the TIM recorded in the registers MEMA and

the TIM memory WM, to keep the wagers up to date in each race, to compute the odds every 70 seconds for display purposes, and at the end to compute the payoff on the three pool winners. The boxes at the right are those which have to do with the control and driving of the system. They include all of the error checking components and the devices which furnish critical signals to latch and unlatch the keys on the TIM and which (and this is of course very important) make sure that all of the TIMs are searched for their data. As the patent makes plain, the various devices used are all familiar ones. They involve very detailed circuitry painstakingly worked out, but there is no novel circuitry involved as is clear from the face of the patent and from the trial evidence.

VI

In characterizing the claims in suit plaintiff has styled the subject matter of Claims 20 through 22 as the totalizator system invention, Claim 23 as the non-allowed runner subsystem invention, Claims 24 and 25 as the TIM scanning subsystem invention, and Claims 26 and 27 as the erroneous data checking subsystem invention.

FPI—SS—3-17-72—30M—9153

141

Claim 20 would seem, loosely, to claim the combination of a plurality of conventional TIMs, means of collecting from the TIMs and despatching into the system the betting data on each entry and identifying those data to the originating TIM, and means of aggregating the wagering data and sending an acknowledgment signal to the TIM so that it will stamp up and issue a ticket with the wagering data on it. If reference is made to Exhibit 11, it will be seen that the patentee identifies the TIMs as TIM 1 and TIM N, typical of a plurality of TIMS. He also identifies (Exhibits 11, 11A) the generating means for generating signals representing the wagered entry and the TIM as the step pulse generator, the scan counter and decoder, the entry register, the storage address generator, and the aggregator address transmitter as well as the buffer. Finally, the transaction calculating means for performing a calculation on the generated signals and transmitting an acknowledgement signal (when appropriate) to the TIM, so that the ticket will issue, is identified as registers MEMA, updater UAA and amplifier AKA. Cutting through, the system of Claim 20, then, comprises a set of commercially available fairly standardized TIMs,

FPI—SS—3-17-72—30M—9153

appropriate electronic linkage between the TIMs, an aggregator, ~~XMX~~ a unit adder, and an acknowledgement-signal amplifier between the unit adder and the TIM so that aggregating the wager effects an electromechanical release of the betting ticket.

The claim is strikingly barren of any genuine specification of means. Only by reference to Claims 21 and 22 does it become clear that the "calculation" of Claim 20 element (C) is the aggregation of the wagers and storage of them through the updater UAA and memory MEMA. The claim relates only to the simple operation of depressing one wager key on a TIM with the effect of actuating the updater to increment the register MEMA by the number one and effect, by return signal, an automatic release of a receipt or betting ticket. The detail of the circuitry, outlined in Exhibits 11, 11A by the heavy lines, and described at Tr. 170-179, 185-208, evinces no novelty. Each component is, as the specification makes plain, a familiar of the prior art (existing in various forms), and it performs its familiar role in a familiar way. The undertaking of the combination is an easy one, aggregating wagers without

FPI—SS—3-17-72—70M—9153

losing track of the horse on which and the pool in which the wager was placed, or the TIM at which the wager was placed.

The obviousness of the system is most readily seen in Annex A. The combination of means presented by Claim 20 is an utterly simple aggregator of punched-in data. Every component is in its predictable place and does its - in this field - simple office simply. The TIMs (Column 11, lines 43-67) are described "as of the type which" (line 43-44), and the record is clear that such TIMs were articles of commerce. The buffers are rudimentary; essentially "or" gates, each is wired to one of the keys (1,2,3 ... n) in each TIM, and they pass the wager pulses to the entry registers (Column 11, lines 68-72). The entry register may be a plurality of flip-flops (Column 14, lines 9-24) of the kind already described (Column 12, lines 32-35) and as described in Richards, Arithmetic Operations in Digital Computers, Exhibit K, p 48. Such use of flip-flops as registers was rudimentary, and is described in Richards Digital Computer Components and Circuits, 1957, p.28 (Ex. 145; the Richards text is cited in the patent, Column 13, lines 34-35). The progress to the storage address

generator (SAGA) and aggregator address transmitter (AATA) is, again, conventional (Column 7, lines 12-24, 41-46, 49-52; Column 14, lines 59-72, Column 15, lines 1-9). Both are, essentially, "and" gates, at least in simplex operation, requiring a coincidence of the GERA signal and the entry signal in the case of SAGA, and, in the case of AATA, the coincidence of the AADR signal from SAGA and the SADD signal - the GERA and SADD signals are time-separated (D-7) signals from the control KA . The GERA and SADD signals simply reflect the result of the error test routine and derive ultimately from the step pulse (STP), scan counter (SKA) and decoder (DEC) circuitry that links into the system of Claim 20. The signal from the aggregator address transmitter (AATA) selects in the "memory," the multiplane magnetic core matrix (MEMA), the row and column which has in store as its "word" the number of wagers theretofore made at the TIM under scan on the horse selected and effects a "read-out" (MOA) to the updater (UAA) which adds "one" to the number part of the read-out "word" and restores it (MIA) to its row and column in MEMA and simultaneously despatches through the amplifier AKA a signal (ACKA) which as an "acknowledgement"

145

reaches the TIM through mesne circuit paths to unlatch the depressed wager key in the TIM, releasing the ticket which is imprinted by simple electromechanical means in the TIM in the usual way (Column 8, lines 2-32, Column 13, lines 1-22, 52-62, 40-44). As the specification states, "Such recirculation type magnetic core matrices are well known" (Column 13, lines 32-33), and the updater (UAA) is a unit adder "and many are available in the present art" (Column 13, lines 52-53),and the specification refers to the two Richards texts. The particular chapter of "Digital Computer Components and Circuits" is not in evidence but the History and Introduction portion of the text (Exhibit 145), particularly pp 27-32 and Fig. 1-3, demonstrate the conventionality of the Claim 20 system.

If Claim 20 is narrowed to the specific figures and text of the patent it is necessarily a very narrow claim indeed, but in language it is extremely broad. If read in the first way, it is difficult to extricate the "means" elements of Claim 20 from the specification because the specification is written around the dual componentry and dual mode of operation and deals throughout with daily

146

double wagering. If read broadly in obedience to its literal language, it inures as a statement of aims rather than as a workable statement of a union of identifiable means. But by either reading no unobviously new union of means is taught. In the striking language of Mr. Justice Matthews in Pickering v. McCullough, 1881, 104 U.S. 310,318,

> "In [the patentee's] apparatus, it is perfectly clear that all the elements of the combination are old, and that each operates only in the old way. Beyond the separate and well known results produced by them severally, no one of them contributes to the combined result any new feature; no one of them adds to the combination anything more than its separate independent effect; no one of them gives any additional efficiency to the others, or changes in any way the mode or result of its action. In a patentable combination of old elements, all the constituents must so enter into it, as that each qualifies every other; to draw an illustration from another branch of the law, they must be joint tenants of the domain of the invention, seized each of every part, per my et per tout, and not mere tenants in common, with separate interests and estates. It must form either a new machine of a distinct character and function, or produce a result due to the joint and co-operating action of all the elements, and which is not the mere adding together of separate contributions. Otherwise, it is only a mechanical juxtaposition, and not a vital union."

See also Anderson's-Black Rock, Inc. v. Pavement Salvage Co.,

147

1969, 396 U.S. 57, 60-61. So here, the system of Claim 20 represents a linear linkage of known devices each performing in sequence its familiar task. No discovery of any novel union of such means is present, but only a functionally adequate union of means in which each means is used to do what its nature and previous use suggest. The means combined in the system of Claim 20 neither embody nor obey any new law of cooperation.

Claim 21 adds nothing. (See Tr.209-229) Element 21(A) simply identifies the matrix of "addressed," i.e., selectable or locatable magnetic cores carrying the bits making up the "word" that specifies and is specific to the aggregate wagers on one selection at one TIM - the registers MEMA. Element 21(B) is part of the idea of element 21(A); it simply specifies that the array of cores in the selected column and row will be such that it responds to the signal to MEMA. Element 21(c), similarly, signifies that read-out of the "word" to the updater UAA will occur in the form of MOA. Element 21(D) specifies the updater UAA. Element 21(E) identifies the signal path for MIA, the signal-set comprising the read-out word with its number part now increased by one, and the routine restoration of the word to its proper row and

FPI—SS—3-17-72—30M—9153

column of MEMA. Element 21(F) refers again to the updater's simultaneously triggering the AKA unit to send out the acknowledge signal ACKA through the system - to the control KA, whence it issues as the signal CONA to the interface, where it becomes the signal CON and proceeds to the TIM to release the ticket. Claim 21 particularizes Claim 20. It adds nothing to the combination.

Claim 22 (outlined Tr. 230-237), like Claim 21, furnishes particulars of Claim 20, adding the circumstance that the second group of data comprised in the AADRA signals (the M + 1,2 ...N set) passes from the storage address generator (SAGA) to the TIM address transmitter WATA (W = TIM) [as the first group of AADRA signals (the 1,2 ... M set) passes to AATA], thence passes as the signal WADR to the TIM memory WM to effect read-out, as the signal WO, of the word reflecting the total wagers to that time at each TIM by selection, updates the number part of the word in the unit adder UAW, and restores the word, incremented by one, as signal WI to the correct location in TIM memory WM (Column 7, lines 18-24, 39-42, 44-46, 52-54, Column 8, lines 53-63, Column 13, lines 47-62). There is no "acknowledge" circuit. The specification seems, logically, to

require essentially the same role of MEMA and WM, and it was said at the trial (Tr. 234) that the MEMA and WM memory modules were interchangeable. (See Column 13, lines 11-18, 47-49.) The elements of Claim 22 disclose that WM and the immediately associated components comprise a conventional memory and unit adder used as a simple aggregator. (See Column 13, lines 32-39, 47-49. Claim 22 adds nothing to Claim 20: the function assigned to WM in the specification makes it clear that elements (B) and (C) of Claim 20 can be taken to refer to the WM function no less than to the MEMA function provided the acknowledgement signal role is denied to the updater in the WM path. (Parenthetically, the TIM memory WM and associated updater UAW are not twinned in the system. The TIM address signal WADR to the TIM memory can emanate from whichever side is "master," A or B, i.e., from TIM address transmitter WATA or a presumed WATB. The AADR signal from the aggregator address transmitter AATA is, similarly, the signal from whichever address transmitter is master, but it is fed to both memories, MEMA and MEMB.)

Claim 23, the "scratch" subsystem, does not depend on Claim 20. As outlined (Tr. 237-247, Ex. 14,14-A) by one

150

of the patentees, the scratch subsystem provides a set of steady signals (SKR1,2 ...N), initiated at switches, SKW1,2 ... N, on the Console, C, to interdict the processing of wagers on those of the entries 1,2 ... N which have been scratched; the interdiction is accomplished by using "a conventional equality comparator"(Column 14, lines 35-36) to generate an SKRI signal when a scratch signal, e.g., SKR1 (meaning horse 1 has been scratched) coincides in the comparator (TFSA) with a wager signal, e.g., H1N (i.e., horse 1 bet at TIM N) on the scratched horse; the SKRI signal functions to trigger a reject signal to the TIM and to "step" the scan to the next TIM. (Column 3, lines 41-45, Column 5, lines 3-20, Column 10, lines 34-51, 54-55, 59-61, 64-71, Column 12, lines 22-28, Column 14, lines 35-43.) The system, that is, comprises the conventional TIMs, a switch device to permit the emission of a set of steady scratch signals, a conventional comparator to match scratch signals with signals for attempted wagers on scratched entries, rejection signal circuitry and the acknowledgement circuitry of Claim 20(C). The idea of the system is simple; the simplicity is not that of discovered but of obvious simplicity, and the means invoked are an obvious dictate of the

simple end sought.

The claim does not in reality go beyond the obvious teaching of the use of a comparator as a guard against taking wagers on scratches. The comparator compares the scratch signals with the wager signals and, in the case of coincidence, sends out a signal. That signal is used to trigger the reject and step impulses. Element (B) says nothing. It is an unreal multiplication of words. Switches do not "generate" "signals"; they make and break electrical contacts or paths. What must be meant is that there should be a key or switch for each runner number which when closed, completes a circuit that sets up the identifying signal for a particular runner number in the comparator. But that much is of the essence of a comparator's existence. Comparators exist to compare signals for identity or difference in a variety of ways (some of which can be gleaned from the excerpts from the British patent (749,836) cited by the patent office, bearing in mind that the signals involved in the British and the present patent are binary numbers encoding numerical and verbal information; the HSB and RCP elements in the British patent are comparators). The

FPI—SS—3-17-72—30M—9

comparator reflects the result ot its comparison in a signal and that signal, of course, can be used to do the obvious, to step the scan to the next TIM, or to unlatch the depressed key on the TIM without issuing any ticket, or both.

Element (E) is not really part of the system claimed in Claim 23, and the awkward indication of the (E) trace on Exhibit 14 as going around the memory MEMA and the updater UAA, but through the amplifier AKA, discloses that embarrassing fact. The "system" of Claim 23 is devoid of means for generating an acknowledgement signal, or of means for aggregating the wager that is to be acknowledged because and only because it is correct to aggregate it. A glance of Exhibits 14, 14A explains that the scratch comparison and rejection system are upstream of the entire transaction calculator TCA; the scratch comparison and rejection are part of the transaction processor MRA activity, and, logically, must precede the TCA functions in real time so that the false wager is not aggregated in MEMA and WM.

FPI—SS—3-17-72—30M—9153

153

The patentee Weida outlined Claim 24 (Tr.249-262, Exhibits 15, 15A) with referenc to TIM scanning when no wagering transaction is being made at the TIM. It should be noted that, strictly, Claim 24 and its dependent Claim 25 are the only ones of Claims 20-27 in which the plurality of the TIMs is significant in the claim. The subject matter of the other claims is not related to the plurality of the TIMs. Column 1, lines 51-69 describes the object of the system so far as concerns Claims 24 and 25: to provide a high-speed scanning means for interrogating a plurality of relatively slow-operating TIMs. "Scanning means" select the TIMs for interrogation sequentially. Interrogating means transmit an interrogating signal (SCN1A, 2A...NA, Col.3,11.48, 49)to the selected TIM, and, if the TIM is ready for a transaction it will transmit a selected transaction signal (H1N, H2N...HNN, where TIM N is scanned). Means sense for the transmission of the selected transaction signal, and, if none is sensed, that causes the scanning means to step to the next TIM and interrogate it. Provision is made to insure that the high-speed scanning means does not, by returning to make a second scan,

PPI—SS—3-17-72—30M—9153

cause a "redundant" second processing of the selected transaction signal (as to which see Column 10 line 72-Column 11 / line 34).

An initial signal (ICL) presets the scan counter SKA to 1 (Column 3, lines 58-61); the scan counter SKA is a chain of conventional cascaded binary counters, as shown in Richards, Arithmetical Operations in Digital Computers, pp. 194-197, Exhibit L (Column 11, line 74-Column 12, line 7); the output of the scan counter SKA is fed as the SKNA signal to the scanner SCA (Column 3, lines 61-64). That scanner is a decoder which decodes the set of "1"s and "0"s from the scan counter SKA; the scanner may be of the kind shown in the same Richards text, pp.71-75, Fig.3-3(a), Exhibit M (Column 12, lines 8-21). The scanner SCA decodes the SKNA signal and feeds it to the interface of the TIM under scan as the signal SCNNA, the second N being the identifying number of the TIM under scan (Column 3, lines 64-67). The keys of the TIMs, when depressed, close switches, each key and its switch representing a runner, and one side of all the switches being connected to a common conductor; the signal from the scanner (e.g., SCNNA) connects to the common side of the

switches, and, if one switch is closed (and, absent a defect, only one switch can be closed at a time), the scan signal crosses and issues from the TIM as a "selected transaction signal" (e.g., if from TIM N, as one of H1N ... HNN). See Column 3, line 67 to Column 4, line 17. If none of keys of the TIM has been depressed - no wager is being made at the instant of scan, (and this is ascertained by the control KA's probing the "transaction-made" unit BMA with the TFB signal from the "1" output of the TFBF flip-flop (Fig.3)), -the scanner is stepped along to the next TIM (see Fig.2, at right, Fig.3 at top). See Column 4, lines 35-45 . So too, if, by error, the key for a scratched entry has been depressed, the scratch circuity produces a signal at the "or" unit 01 (Fig.3) which steps the scan to next TIM. See Column 5, lines 13-18. (The reiteration of the scan signal as a result of the false entry test is not significant here - Column 6, lines 21-30.) When a wager has been processed and error tested to the point at which the CONA signal is generated at the flip-flop CONF (Fig. 3) and has cleared delay unit D3, it effects, in transiting the "or" unit 01 (Fig.3), a "step" of the scanner to the next TIM (Column 6, lines 53-62). The

156

confirmation circuitry, of course, unlatches the depressed wager key in the TIM and issues the bet ticket (Column 8, lines 29-32). (The N + 1 check is not involved in Claims 24-25, Column 8, line 67 to Column 9, line 19). The "step" signal STEP is generated, as explained at Column 10, lines 54-71, when there is no error and when no CONA signal has been generated through processing a wager to validation and the issuance of a bet ticket: it is done when no wager signal is sensed or a wager on a scratched entry is found in the system. To be short, as Fig.3 illustrates at upper left, the scan steps when "or" unit 01 receives either (a) a signal that no bet has been made (BMD'), or (b) that the wager signal is on a scratched entry (SKR1), or (c) a valid bet has cleared the system to ticket issuance with the evolution of the CONA signal within the control KA of the transaction processor MR (Fig.2, right, Fig.1A, left, Fig.3, left center). (The fourth signal at "or" unit 01, ICL, is not here relevant. It appears to function as a general system-starter (Column 3, lines 58 et seq.).) Finally the scan is prevented from re-scanning a TIM while the system is still in process of passing a "confirm" or

"reject" signal to that same TIM by interposing an "and" unit A10 connected to the "do not confirm" and do not reject" outputs of the confirm and reject flip flops (Fig. 4, center, "CONAF" and "REJAF") and feeding the scan signal SCN1A (SCNNA) to the same "and" unit A8 so that it clears the interface IF (IFN) only if neither a confirmation nor a rejection is in transit through the system. This follows from the datum that, when the SKRI and CONA trigger the STEP signal, they also (mediately) function to set the REJAF and CONAF flip-flops respectively to "1" (via "and" units A 92 and A 90, Fig. 4). During that period the TIM originated BID1 signal is operative. After the key and ticket release (or key release only) is triggered, the BID1' signal sets to "0" the CONAF or REJAF flip-flop (whichever had been set to "1" because of a confirm or reject) thus providing the missing signal for the coincidence of signals required to clear the SCN1A scan signal through the interface to the TIM as interrogation signal SCN1 (SCNN).

Again, the subsystem claimed combines conventional components to perform a familiar assignment in a conventional way. Claim 24 commences with the plurality of commercially available TIMs as element (A). The operational language of (A) means simply that when a TIM wager key is depressed, it closes a circuit switch; that closure completes a circuit

leading from the TIM via one or another of the buffers (all "1" keys leading to buffer "1," all "N" keys to buffer "N") to the transaction processor MR, and, specifically, to the entry register, 1HRA, Fig.2. The scanning means of claim element (B) which interrogates the TIMs in order is the conventional binary counter which emits the SKN signal and which is stepped by return signal from the system, closing the impulse sequence by stepping or advancing the scan counter SKA. The interrogating means of element (C) is the scanner or conventional decoder SCA which decodes the signal SKN and transmits it as (for example) the signal SCNNA to the interface IFN which transmits it to the TIM where it, in effect, becomes the wager signal and proceeds into the system. The sensing means of element (D) for sensing a wager signal is the BMA unit in transaction processor MRA (Fig.2), and is an evidently simple logical element (Column 14,lines 29-34) made up of "or" units and an "and" unit. The stepping means of element (E) which is to function when the no wager signal (BMD') is present, is the "and" unit A1, the "or" unit O1,and the step pulse generator (Fig.3) and the binary counter SKA (Fig.2).

FPI—SS—3-17-72—30M—9153

No discovery is present here. Detail abounds, but ingenious novelty is not present. It is pedestrian circuitry that accomplishes its very simple goal of furnishing a pulse that tracks through a system (with the functions of which scanning is not concerned) and, on circuit completion to origin, ticks the binary counter on to the emission of its next count signal.

Claim 25 adds nothing. It simply covers the other alternative - that a wager has been made - and it requires that a stepping control exist so that the scan does not step to the next TIM before the bet has been processed. The claim is ineptly phrased, for to specify "means for processing a selected entry transaction signal sensed by said sensing means [of Claim 24(D)]" is to call for a means of limitless dimensions, irrelevant to the nature of the claim. (The patentee outlined the claim at Tr. 262-272.) The point of the claim is to add to the elements of Claim 24 the element of means to delay the stepping of said scanning means to select the next TIM until any selected transaction signal sensed by said sensing means has been confirmed as a valid wager or rejected

as an unallowed transaction. The added means of Claim 25 are, of course, not the whole data processing system, as Exhibits 15, 15A suggest (cf. Tr. 265), but the fact that the CONA, BMD' and SKRI signals alone directly STEP, and REJA does so mediately. The consequence of that is that in the case of a duly processed wager, the Step pulse generator (Fig.3) is not energized, to move the scan counter SKA on (Fig.2) to issue a new SKNA signal to the scanner SCA to initiate the new SCNNA, SCNN sequence through interface IFN to TIM N, until the CONA signal is at least despatched to interface IFN, and there generates the CON signal that releases the wager ticket.

Claim 25, the rest of Claim 24 in reality, is equally obvious, the same detailed and uninspired circuitry doing the routine routinely. Neither Claim presents anything except a rudimentary scan system, nothing approaching the versatility of Schrimpf, No. 3,029,414 (Exhibit 3A), passed over so lightly in the office action. It is not possible to conceive that Claims 24 and 25 could have survived the prosecution if the Patent Office had examined the claims with the required particularity.

Claims 26 and 27 (Tr. 272-286, Exhibits 16-16A), are addressed to one of the error-checks incorporated in the total device. They parallel Claim 23, which dealt with the check against wagers on scratched entries (Tr. 289). The entry checking means is the "two entry transaction" unit THBA of Fig. 2, located in the transaction processor MRA; it "can be a conventional majority logical element" which generates a signal THBI if the entry register (1HRA) emits wager signals on more entries than one (Column 14, lines 44-56; the Boolean equation [correctly given in Exhibit 2, p.35, lines 15-16] means simply that if the signal TFT coincides with the coincidence of wagers on any two or more entries, the THBI signal is generated.

Again, the Claim element 26(A) is the commercial TIM as in Claim 23, Claim element 26(B) speaks of "entry checking means" for detecting erroneous wager signals and thereupon transmitting a rejection signal to the TIM. Claim element 26(C) is the acknowledgement means as in Claim 23(E). The patentee visualized the subject-matter of Claim 26 (or, perhaps, of Claims 26 and 27) as the flagging down of "two horse bet" situations and of false wager signals originating within the system (Tr. 275-296, particularly 277-278).

FPI—SS—3-17-72—30M—9153

The two claims relate to the second and fourth tests in the signal test routine schematized in Figure 3, the tests utilizing the flip-flops TFTF and RSCF. If the first test (test for bet made) verifies that a wager signal has been entered in the entry register 1HRA, the test-for-two signal TFT is generated in the flip-flop TFTF, and, through use of the two-entry transaction unit THBA (a conventional majority logical element), determines whether more than one wager signal has entered the entry register as a result of the scan of the TIM then under scan; if so, the THBI signal issues from the majority element THBA (Fig.2) and, in control KA, coinciding with the TFT signal in "and" unit A7 (Fig.3), passes "or" unit 03, sets the ERAF flip-flop to 1 and generates signal ERA, which, via "or" gate 04, sets the REJF flip-flop to one, generating(after delay at D4) the REJA signal that in the interface (Fig.4) is (along with scan signal SCNNA) a component at "and" unitA62 of the signal that sets the REJAF flip-flop to 1 and despatches the reject signal REJ to the TIM (Column 4, lines 49-74, Column 9, lines 57-62, 67-72, Column 10,lines 31-50). If there is no duplicate signal, THBI' initiates the next error check, the scratched bet check.

The routine then disposes of the scratch test, and, if the wager is not on a scratched entry, the signal SKRI' (negating a scratch bet) energizes the 0 input of the scratch flip-flop TFSF and the 1 input of the RSCF flip-flop to commence the test for a false signal through the RSCNA' signal and its invert RSCNA, identifiable as "reset scan." The language of the specification is not very fortunate in explaining the false signal sequence, but apparently the first-functioning signal is the invert, RSCNA', the 0 output of the RSCF flip-flop. It initiates the test for the systemic validity of the wager signal being processed by being fed to all the interfaces, IF1 ... IFN, and, necessarily reaches the IF of the TIM under scan, say, e.g., IFN, and terminates the generation of the scan signal SCNNA. No wager signal should then persist in the system since it is the scan signal that is fed out of the TIM as the "selected transaction signal";"after a delay to permit the passage of signals through the loop," through the system including the TIM (Fig.3, D1), the RSCNA signal is fed from the 1 output of the RSCF flip-flop to the BMA unit (Fig.2) to test for the presence of a false wager signal in the entry register (note in Column 14 line 31 that the equation is satisfied, and the BMD signal is generated, if either the

"test for bet signal" or the RSCNA signal coincides with a wager signal); if a wager signal is present (and it should not be, since the invert RSCNA' has terminated the scan signal SCNNA), the BMD signal returned to the control KA at "and" unit A6 with the RSCNA signal (Fig.3) will feed through "or" unit 03 to the 1 side of flip-flop ERAF and generate ERA (which shuts MRA down) and, via "or" unit 04 will set the flip-flop REJF to 1, generating, via delay D4, the REJA signal (Fig.3) which (as before) via "and" unit A62 sets the REJAF flip-flop to 1 and despatches the REJ signal to the TIM (Column 5, lines 20-46, Column 6, lines 16-17, Column 9, lines 56-62, 67-72, Column 10, lines 31-51).

As in the case of Claim 23(E), relating to the test for non-allowed scratch signal, the acknowledgement means does not genuinely function as part of the error checking role of the combinations of Claims 26 and 27. To be sure, if there is no duplicate-wager or false signal or other error, the valid wager will be processed through ticket issuance. That,however, is not functionally connected with either the test-for-two or the false signal or the scratch error tests, but, rather, is functionally related to aggregating wagers. In the case of

FPI—ES—3-17-72—30M—9153

the "two-horses bet" error check, the check system is upstream of the aggregation and updating steps which alone can give rise to the acknowledgement signal. There is, then, no acknowledgement means in functional union with the "two-horse bet" error checking means except in a more inclusive combination, not claimed, that would embrace the aggregation of the wager.

The "test for false wager signal" of Claim 26 is somewhat different; because of the obscurity of the explanation of the operation of the RSCNA signal and its invert (Column 5, lines 20-46, Column 6, lines 18-33, 47-56), the final result of the routine is puzzling. Figure 4 explains little in describing the path that RSCNA' takes to the "and" unit A8 to generate, if SCNNA and AMST coincide with it, the SCNN signal, if the BID1' signals are at the 0 inputs of CONAF and REJAF; that sequence can be related to the CON signal to the TIM via "and" unit A61 and to the holding effect described in Column 11 lines 11-39. But no integral combination of the false entry check with the acknowledgement means UAA and AKA (which are components of the distinct aggregation function) is present.

It may be thought that Claim 26 refers only to the false signal test (despite the explanation at Tr. 277-278) and

that Claim 27 refers only to the plural wager signals error. The effect of the language of Claim 27 is to substitute the means of Claim 27 for the means of Claim 26(B).

As in the case of Claims 20 through 25 no discovery is disclosed, only painstaking articulation of familiar means to perform simple error checks through use of circuitry suggested by the nature of the tasks to be performed and the nature of the conventionally appropriate components that the tasks themselves pointed out as suited for the service.

The claims depend absolutely on exploiting the last paragraph of 35 U.S.C. 112, which has been said to have been intended to mitigate such holdings as that in Halliburton Oil Well Cementing Co. v. Walker, 1946, 329 U.S. 1, which dealt with the meaning and limits of the often expressed principle that in claim drafting the draftsman must not use "conveniently functional language at the exact point of novelty" (General Electric Co. v. Wabash Appliance Corp., 1938, 304 U.S. 364, 371). In Halliburton Mr. Justice Black said for the Court (329 U.S. at 8-9):

> "A claim typical of all of those held valid only describes the resonator and its relation with the rest of the apparatus as 'means associated with said pressure responsive device for tuning said receiving

> means to the frequency of echoes from the tubing collars of said tubing section to clearly distinguish the echoes of said couplings from each other.' The language of the claim thus describes this most crucial element in the 'new' combination in terms of what it will do rather than in terms of its own physical characteristics or its arrangement in the new combination apparatus. We have held that a claim with such a description of a product is invalid as a violation of Rev.Stat. § 4888. Holland Furniture Co. v. Perkins Glue Co., 277 U.S. 245, 256, 257; General Electric Co. v. Wabash Appliance Corporation, supra. We understand that the circuit court of appeals held that the same rigid standards of description required for product claims is not required for a combination patent embodying old elements only. We have a different view." (Footnote omitted.)

The Court held the claim bad because it embraced every possible means that, in union with the other elements of the combination, already in the prior art as combinations, would emphasize the sought-for echoes. Mr. Federico (then Examiner-in-Chief, United States Patent Office) said in his Commentary on the '52 Act (35 U.S.C.A. pp. 25-26) in discussing the third paragraph of Section 112 and its relation to such cases as Halliburton:

FPI—SS—3-17-72—30M—9153

> "It is unquestionable that some measure of greater liberality in the use of functional expressions in combination claims is authorized than had been permitted by some court decisions, and that decisions such as that in Halliburton Oil Well Cementing Co. v. Walker, 67 S.Ct. 6, 329 U.S. 1, 91 L.Ed.3 (1946, are modified or rendered obsolete, but the exact limits of the enlargement remain to be determined. The language specifies 'an' element, which means 'any' element, and by this language, as well as by application of the general rule that the singular includes the plural, it follows that more than one of the elements of a combination claim may be expressed as different 'means' plus statements of function. The language does not go so far as to permit a so-called single means claim, that is a claim which recites merely one means plus a statement of function and nothing else. Attempts to evade this by adding purely nominal elements to such a claim will undoubtedly be condemned. The paragraph ends by stating that such a claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. This relates primarily to the construction of such claims for the purpose of determining when the claim is infringed (note the use of the word 'cover'), and would not appear to have much, if any, applicability in determining the patentability of such claims over the prior art, that is, the Patent Office is not authorized to allow a claim which 'reads on' the prior art."

Much is certainly read into the third paragraph of Section 112 (see e.g., Kockum Industries, Inc. v. Salem Equipment Inc., 9th Cir. 1972, 467 F.2d 61; Application of Knowlton,

C.C.P.A. 1973, 481 F.2d 1357, 1361, 1366-1368), but, of course, some workable means must be found in the specification (see, e.g., Application of Jones, C.C.P.A. 1967, 373 F.2d 1007, 1014) in order to satisfy the critical requirement of Section 112 that the claims particularly point out and distinctly claim the subject matter which the patentee regards as his invention. Cf. Application of Bozek, C.C.P.A. 1969, 416 F.2d 1385, 1390.

The structure and content of the claims requires examination in the light of plaintiff's key argument that, while Claim 20 is the most basic and inclusive (i.e., the least limited in its range of reference), dependent Claim 22 is the most important, and that the most significant area of novelty centers around the "means" for generating signals representing each TIM's identifying number and the use of electronic data processing(EDP) means for aggregating TIM window bets - coupled with overall use of EDP means to service parimutuel betting at racetracks. Subordinately, it is argued that Claim 22 manifestly requires EDP means (since it uses the language of "memory," "addressed memory positions," "address-selection means," "reading out"), thus it is claimed, mandating an EDP reading of Claim 20. Plaintiff's Posttrial Brief, pp.7-8.

FPI—SS—3-17-72—30M—9153

A208 The last point is valueless. Hybrid systems exist. Deciding how many components to convert to EDP is a matter of informed choice.

Returning to the first point, plaintiff argues that "the novel TIM number signal generation means of Claim 22 provides for a synergistic result - the same TIM number signal generation means is used both for aggregation of the TIM window bets and for scanning of the same TIMs for betting data"(Post-trial brief p. 8). That is, the scan counter SKA ("a chain of conventional cascaded binary counters wherein each binary counter has an output from both its '1' and its '0' sides such as those shown ... on page 194 of Arithmetic Operations ... by R.K. Richards ... 1955"; Col. 11, line 74 to Col. 12, line 5) is the disclosed means of generating the TIM number signals, and, via decoder DEC ("similar to scanner SCA," Col. 14, line 75, which is a"decoder which decodes the combinations of "1's" and "0's" from the scan counter SKA," as shown on pages 71 et seq. of the same Richards book, Fig. 3-3(a), Col. 12, lines 8-21) and Storage Address Generator SAGA(Col.14,lines 59-74, see pp. 143-144 supra) produces the TIM address WADR, used to address the TIM memory WM so that the wagers on each TIM can be aggregated.

The scan counter SKA (the argument continues) also generates the scan signal SKNA fed via scanner (a decoder) SCA as SCNNA through interface IFN and thence as SCNN to TIM N, where it goes through the latched entry key switch to emerge as the wager signal (e.g., HNN). (Posttrial Brief p.8). Plaintiff's counsel explained the concept at the close of the trial (Tr. 3683-3687, 3729-3732; cf. Tr.230-236): the SKNA signal travels a many-wired cable carrying (one binary "place" to each wire) a binary number - say, seven wires (eight?) to accomodate numbers up to 128 for 128 TIMs ($128=2^7$). The insistence is that the synergistic element is in the manifold use of TIM number signal generation means of Claim 22 (that is element 20(B), which is picked up in elements 21(B) and 22(B)) to scan the TIM for betting data and to aggregate the TIM wagers, assuring the correct association of TIM and wager. Phrased somewhat differently the same argument is reiterated in Plaintiff's Reply Brief (R4-R9, R-14-R-15), and in Plaintiff's Proposed Findings of Fact etc. at F 107, F 111, F 113, F 114, F 119 and F 159, proposed findings 4.35, 4.4b5, 4.4b6, 4.4c11, last sentence, 4.4c12, and 6.21-6.23).

FPI—SS—3-17-72—20M—9153

Special emphasis is given to Claim 20(B) (generating means responsive to the wager signal to generate signals representing the entry and the originating TIM), and it is asserted that, while Claims 20-22 and 24-25 together define the body of the patented Tote, parent Claim 20 is its heart, Claim 20 (B)'s TIM number signal generation means is the synergistic link, and the Claim 22 invention is the most important. It is argued that Claim 22 recites the TIM window bet aggregation, using the TIM number signals (Claim 22(B), address-selection means for receiving signals "generated by said generating means" - the element 20(B) means - for selecting the particular memory position associated with the particular TIM). It is asserted that TIM number signal generation and TIM window bet aggregation were new in racetrack lore and that the Claim 22 TIM memory WM is "most important" (Posttrial Brief p.6) because it includes the novel EDP elements of Claim elements 20(B) and 22(B). Novelty for all elements is claimed because they are "limited to ... EDP technology." More seriously, it is asserted that the TIM number signal generation means of Claims 20-22 (Clause 20(B)) as well as the TIM memory WM (Claim 22, especially element 22(B)) "are completely novel over all the prior art" (R7).

FPI—SS—3-17-72—30M—9153

Plaintiff's reading of the Claims puts strains on them that they cannot support. Strictly, Claim element (A) in Claims 20, 23, 24 and 26 is not genuinely a combinatorial element of the combinations of the claims. The systems of the patent (Column 1, lines 11-13) are "systems for processing data received from" TIMs. On plaintiff's own constant (and groundless) argument that the completely EDP character of the systems is one significant element in the patentable novelty of the systems in the racetrack field, the TIMs are outside the field of the inventions, for they are mechanical and electro-mechanical, and as slow as ever. And note Columns 15-16 of the summary, which treat the TIM, its switches, etc. as apart from "A data processor ... comprising" ten subsystems and sub-assemblies which are then described briefly but do relate back to the entire specification.

To provide a data processing system to a plurality of TIMs is not to present a combination that could be patentable, for as a combination it is, obviously, exhausted, and patentable novelty could reside only in the union of data processing sub-means, new, old or both, that as a data processing system or subsystem served the plural TIMs. That is, in reality the

FPI—SS—3-17-72—30M—9153

structure of the patent as a whole, despite the choice of claim form. To put it another way, the TIMs and their demands for service were not an element of the claimed inventions; they rather represented the job assigned to the systems technicians. Note Claims 1, 10, 15 and 17. (And, in passing, note that parent claims 2 and 3, easily resist the contention that they are totalizator rather than data processing claims.)

Apart from the skew given to Claims 20-27 by incorporating the TIMs in them as elements of the allegedly patentable combinations, the claim language itself does not support the constructions plaintiff seeks to impose on it. Specifically, the closing language of Claim 20 (element (C)) - "only if the transaction is correct" is null language. It cannot import, as plaintiff now suggests, the whole set of error check subcircuits (described in Column 4, line 54 to Column 6, line 12, Column 9, line 57 to Column 10, line 54, Column 16, line 65 to Column 17, line 19, Column 17 lines 64 to 75, Column 18, lines 56 to 67), and it gains nothing from the license of the third paragraph of Section 112. The phrase indicates no means, and it states only a desideratum that is not the subject matter of the union of means of which the Claim is composed. Claim 20 deals with means for aggregating

FPI—SS—3-17-72—30M—9153

wager signals "representing" both runner and the TIM of origin, making a calculation on the signal, and acknowledging the wager to the TIM.

The generating means of Claim element 20(B) responsive to the selected transaction signal is identified by plaintiff as the scan counter SKA, the SKNA output of which is fed to the scanner SCA (a decoder) and another output of which is fed to the decoder DEC and thence to the storage address generator SAGA. It is invoked in Claim element 21(B) and Claim element 22(B). Claim 21 identifies the components of the aggregator centering on the memory MEMA and it represents ABC data processing. "Memories" have to be thus and thus implemented; the very term implies addressed positions for "words," retrieval of them for arithmetical calculations, and return of them to the addressed position. Claim 22 is precisely the same except that it refers to the simpler aggregation centering on the memory WM and involves no acknowledgement signal.

The claimed "synergistic" effect is not present. Annex E presents in stripped down form the components and circuit paths involved. Because of the daily double language

FPI--SS--3-17-72--30M--9153

that entangles the specification, the signal generating effect of BID1 is not made clear; depressing a TIM key definitely energizes a corresponding line to produce a signal on that line in correspondence with the latching key that has been actuated (Tr.188) and that signal must be BID1 (Col.3, lines 67-72,Col. 6, lines 59-63, Col. 11, lines 11-32). Beyond the bare word "decode," nothing of the word-forming function of scanner decoder SCA and the decoder DEC is made explicit. Since, however, the signal from SKA is a simple number in binary numeration, the same signal must be fed to both decoders SCA and DEC.

The output of SCA, is the scan signal SCNNA which issues from the TIM interface IFN as signal SCNN, crossses the closed switch in TIM N "and is fed out as a selected transaction signal" (e.g., HNN) (Col. 4, lines 7-8), goes through the buffer for horse N and enters the entry register 1HRA. The entry register is or may be a plurality of flip-flops, presumably one for each possible entry (Col. 14, lines 9 et seq.); that would mean that, if there are only ten keys on each TIM, there would be only ten flip-flops in the entry register 1HRA, and the entry register could be wired directly to the ten

buffers through a ten-wired cable, and the buffers similarly wired through such another cable to the "selection" side of the ten transaction selection switches in the TIMs. The signal that is "fed out"of the TIM to the buffer as the selected transaction signal would appear simply to "pass through" the buffer (essentially an "or" unit ready to pass a wager signal from any TIM on the entry it handles, Col. 11, lines 68-72) without modification and without providing any information about which ticket machine generated it; and it appears to reach the entry register in the same signal form it had when it left the TIM. At the entry register it is simply a voltage (Tr.1337, 1341, 2770-2775, Exhibit 152).

One input to the entry register is the STEP signal (which also advances scan counter SKA and, hence, produces signal SKNA). The STEP signal "clears" the entry register 1HRA (col. 6, lines 63 et seq.) and at the same time, evidently, sets the TFBF flip-flop (test-for-bet) to 1 and the CONF, REJF and GERF flip-flops to their "0" state.

The other input to the entry register (which has been "cleared" by the STEP signal) is the simple voltage of the selected transaction signal originating in the TIM under scan,

which sets the chosen flip-flop to its "1" state. The "1" output of the flip-flop involved "is connected to one of the lHRN signal lines" leading to the storage address generator SAGA (Col. 14, lines 14-15). It would seem, then, that when the selected transaction signal leaves the entry register lHRA, it is not a compound signal identifying both entry and TIM. In any event, the role of the storage address generator SAGA, is, at minimum, to compound the signal by adding the TIM - identifying information derived from the companion decoder DEC (Col.7, lines 11-17) to whatever, if any, wager identification is implicit in the HRN signal from the entry register. SAGA is a set of "and" units (apparently one for each possible entry) requiring a coincidence of a selected transaction signal, a DKN signal (identifying the TIM) from decoder DEC and a GERA signal (Col.7, lines 12-17, Col.14, lines 63-74). Since the signal is to be stored in the memory MEMA by TIM and by entry, the address of the signal is complete and it moves on under the GERA impulse (another derivation of STEP) as the two group signal AADRA (see Annex F for detail) to the address transmitters AATA and WATA. The address transmitter AATA (in simplex operation) would appear again to be a set of "and"

units requiring the coincidence of the compound AADRA signal with the SADD signal (another, but delayed, derivative of STEP); the address transmitter WATA seems to be similar, requiring a coincidence of the SADD signal and the group 2 segment of the compound AADRA signal; the means of dividing the signal (if that is necessary) are not explained (Col. 15, lines 1-20).

The result is the storage and updating of the complete data in the aggregator memory MEMA and the making of an updated record of the number of wagers at each TIM in the TIM memory WM.

The assertion of synergistic effect evaporates with the observation that the decoder DEC supplies the TIM number to the storage address generator SAGA for inclusion in the address of the pending selected transaction signal which is then stored in two memories; it is stored in MEMA by entry and TIM, and it is stored in the dubiously useful WM as a register of the total number (unsorted) of wagers at each TIM. No unobviously useful economy exists in employing scan counter SKA as such a signal generation means as it may be to feed both the scanner (decoder) SCA and the decoder DEC. If a second

FPI—SS—3-17-72—30M—9153

memory was to be used to store some of the same data being stored in MEMA, obviously it would be done by the same means at the same take-off point. That was the role of the DEC reading of the signal from SKA. A special ingenuity of indirection would be required to do it any other way. SKA is actuated by the omnipresent STEP signal of the step pulse generator STP which is, apparently, in the real time scheme of the system, the significant impulse generator in direct and derivative forms at the scan counter, the entry register, the storage address generator (through the GERA signal), and the address transmitters (through the SADD signal). The two decoders SCA and DEC, evidently, decode the same signal in different senses for use at different stages.

The TIM memory WM does nothing that a mechanical counter on the TIM could not do as well, and, moreover, the TIMs in use at the time in New York were required to and did maintain a separate print out of all transactions, an electro-mechanical or electrical and mechanical operation of familiar sort (Tr. 1841, 2264-2269). If there was a use for the TIM memoray data, reading them out of the more elaborate data required to aggregate and update the wagers in the registers

of the memory MEMA was another way to do it. The allegedly "synergistic" effect is, then, the common attribute of all EDP systems - that they are energized from a common source and are ordered in real time by a common step signal.

The prior art emphasized at the trial and considered in the posttrial briefs and proposed findings is all but confined to totalizator systems and patents. While it has been concluded on the face of the patent and in the light of the disclosures of its cited materials, that the claims in suit do not embrace any patentable discovery or invention, and it has been concluded that the relevant field for inquiry is data processing, of which racetrack parimutuel totalizators are instances, consideration of the totalizators of the prior art confirms the conclusion that no patentable discovery or invention is present.

The prodigious detail involved in discussing the totalizators of the prior art gives them a specious appearance of difficulty and complexity. They are indeed detailed as they must be, but straightforward. The block diagram, Exhibit BL, generalizes the parimutuel data processor in terms of a sequence starting with the wager placed at a TIM and proceeding through pickup of the wager data in a scanner stage, validating and testing it in a processor stage, aggregating the wagers in the first phase of a transaction calculation stage, performing calculations on the data in the odds, etc. calculator, and

displaying the result. Feedbacks from the processing and aggregating stages are shown - a "reject" feedback for erroneous transactions from the processing stage and an "acknowledgement" feedback from the aggregator stage, signifying that the wager has been recorded and a betting ticket will be released.

Handley No. 2,479,681 (1944, 1949)(Exhibit BQ), not cited in the patent office, is easiest seen in Exhibits BQI and II, which enlarge and display in one sheet the seven figures of the patent; each of the patent figures is a segment of a single schematic diagram. BQI outlines in red the principal components of the system, and BQII is the same set of figures color coded to trace out the history of a 10 shilling wager that Horse No. 1 would win and Horse No. 2 place second. Exhibit BS shows Handley in functional or block diagram form.

Starting at upper left of Exhibit BQII, the yellow line shows the shilling stake key depressed; below that the upper blue line shows the 1F key depressed for Horse No. 1 to win; and the next lower blue line shows the 2 key depressed for Horse No. 2 to place. Depressing the wager and stake keys rotates counterclockwise the three interconnected cams 35

(CMC, OPC and TCC) until the tooth on cam OPC is caught by the latching pawl just when the knob on control cam CMC is at topmost and rides the guide to its high point; that action closes contacts (seen just above CMC) CM 2,3,4 and 5 and opens contact CM1. Closing CM3 generates a TIM bid signal, shown by the brown line, which goes to the right, up through change-over contact points and reaches the commutater, which performs the scanner office in Handley. The commutator or scanner disk or wheel has on it five concentric rings. The two outer rings are divided into as many radial segments as there are TIMs in the domain of the scanner; each segment is wire connected to a different TIM. The three inner rings are wire connected into the common data processing system. Brush contacts on a rotatable bar, seen as extending vertically upward from the center of the commutator, provide selective electrical connection between the two outer and the three inner rings. Rotation of the bar connects in sequence each TIM that is ready with a bid signal to the common data processing system. The bid signal (brown) reaches the outermost of the rings, crosses on the bar to the outermost of the inner rings, and thence reaches and energizes the coil of the solenoid LM which slows

FPI—SS—3-17-72—30M—9:53

the commutator bar at the scanner or commutator segment allotted to the TIM making the bid signal. The commutator then returns a "connect" signal CN (traced in purple) to the TIM; the signal (purple) travels from the innermost of the rings to the inner of the two outer rings of the scanner at the segment allotted to the TIM under scan, thence travels via changeover relay contact 6 through now closed contact CM-2 in the TIM and finally through contacts TC-1 and RN1 to energize the relay OP, the "connect" relay. (The RN relay at upper left, the energizing of which closes contact RN-1, functions in the central control's check to assure that the TIM operator has set his TIM for the correct race and the correct number of entries.) The energizing of the OP relay closes contacts OP-1, 2 and 3, shown along the dotted purple line, launching the stake signal (yellow) and the two selection signals (blue) into the system. These signals are simply voltage. Contacts OP4 and 5 (well below OP1, 2 and 3 and offset to the left) have also been closed when relay OP operated (as well as OP6, still lower and further left on the bottom line, the closure of which completes a path to the TIM for a rejection signal). Closing contacts OP4 and 5, connected to the TC or "acknowledge" relay, prepares a path for

the acknowledgement signal (outlined in green). The blue wager signals go to the relay 38 (a pair of relays, A and B) and the stake signal goes to the relay 32 (A and B) at the lower far right.

At the far upper right ("1 and 2 combination counter") 39 is the aggregator for the win and place combination wager. The dual relay 38, energized by the blue wager signals, closes the contacts off to the right of them, preparing paths to aggregate the pending combination wager. The dual relay 32 at lower right, energized by the 10 shilling wager signal, closes switches which send two signals each (4 plus 6 shilling signals) to the win and place aggregator and to the total aggregator. The signals energize solenoids which close the 2 and 3 switches in each aggregator and send out on the green signal lines the two pairs of acknowledgement signals, which, ultimately, reach the TIM's ticket issuing and unlatching mechanism at far left. Enroute, at a point to the right of the scanner or commutator, the signal lines reach a pair of changeover keys, CCR, the operation of which enables a choice between sending the signal from the combination counter or that from the total counter onward as the acknowledgement signal to the TIM. (The

FPI--SS—3-17-72—30M—9153

relays RC and AC, to the left of the changeover keys CCK, are actuated by the ACK signal from, respectively, the combination counter and the total counter.) The chosen acknowledgement signal passes through changeover relay-contacts 3, 4 (at changeover relay WC) and relay contacts 26, 27 (normally closed contacts related to the test key T just above 26, 27) and thence passes through the "operate" relay contacts OP4, 5, which at this time are closed, to energize the TC relay coil, closing contacts TC3, 4 to ground and to voltage potential.

The "connect" signal CN (purple) meanwhile, energizing relay OP, has turned cam OPC counterclockwise slightly; the latching pawl releases and the pawl's vertical member arrests against the second tooth on the cam. When relay TC is energized by the ACK signal, the contact TC1 opens, de-energizing the OP relay and causing contacts OP1, 2 and 3 to open, terminating the stake (yellow) and selection (blue) signals from the TIM. Contacts OP4, 5 of the ACK circuit (green) open as well, as does OP6 in the (red) reject circuit, so that their signals, too, are terminated. Contact TC2 in the bid (brown) circuit is opened as an effect of energizing relay TC, breaking the brown bid circuit and terminating the bid signal from the TIM.

FPI—SS—3-17-72—30M—9153

The TIM, in result, is disconnected from the data processing system. The TC relay is still operating, having closed the contacts TC 3, 4, connecting across it from negative potential to ground.

Termination of the bid signal (brown) from the TIM to the commutator or scanner de-energizes the solenoid LM, and that allows the scanner bar to resume its scan and step to the next TIM ready with a bid signal.

The ACK signal, when it de-energizes the relay OP and opens contacts OP1, 2, 3, also occasions a further rotation of cam OPC and, under the influence of relay TC, the latch on cam TCC is lifted clear of the tooth on TCC and the set of cams completes its rotation. The rotation of control cam CMC trips the large PC latching pawl, permitting the contact PC to close, setting the printing and issuing solenoid to print and issue the wager ticket. The rotation of control cam CMC opens the contacts CM 2 through 5, and, specifically, by opening contacts CM 4 and 5 interrupts the ACK holding path, completing the TIM's disengagement.

Protection of the system from wagers on scratches is provided by manipulating the scratched entry's lever in the

PPI—SS—3-17-72—30M—9153

bank of non-runner control levers (NRC); that action automatically rotates the MNCS switch to adjust the system circuitry to the reduced number of runners. Throwing a scratch lever energizes the relay located directly above it (1NR ... 6 NR), and each such scratch relay has to its right, under the cancel relays, contacts 5 and 6, connecting to cancel relays A and B respectively. If a wager on a scratched horse is made, either on the upper or lower selection signal line (blue), then the corresponding contact (5 or 6) will open, breaking the wager signal line (blue) and energizing the corresponding cancel relay above it. That energization will, in turn, close the corresponding cancel contact to the left (A1 or B1), sending a reflex signal to the TIM via change-over contact 2 and across contact OP6 to the cancel solenoid. Operation of the cancel solenoid engages the solenoid latch with the lower tooth on the control cam CMC and rotates the cam set [illegible] so that the guide atop cam CMC drops, [illegible] opening the CM2 through 5 contacts, terminating the bid (brown) and connect (purple) signals; that de-energizes the OP relay and opens the stake and wager contacts OP1, 2 and 3, aborting the attempted wager

FPI—SS—3-17-72—30M—9153

and resetting the TIM. No ticket is stamped and issued because control cam CMC does not complete the counterclockwise rotation that actuates the printing and issuing solenoid.

Handley includes circuitry, outlined in orange, to protect the system against repugnant dual runner or dual stake signals. The relay RG (runner guard relay) in the transaction processor section relates to mistaken dual runner signals and relay SG relates to mistaken dual stake signals. The relays are energized if more than the "measured" current appropriate to a runner or stake signal appears on the runner (blue) or stake (yellow) signal line. [Note that in each stake cell (28-34) at bottom right a resistance (R 7-9, 11, 12, 14, 16) imposes "measure" on the orange stake guard signal; and that, upper right, the three runner cells exhibit resistances imposing "measure" on the runner guard signal (orange). Relays RG and SG normally are not energized by the signal strength measured to them. A normal runner or stake signal will only balance out the normal guard signal to RG and SG. Hence, if one runner (at relay 38) and one stake signal (at relay 32) close contacts to their respective guard lines, the relays RG and SG are not energized. But if, through error, two or more runner or stake

signals are imposed on the guard lines (from, e.g., other runner or stake cells), the relay RG or SG will be energized, and, there being a direct wire connection - not shown - from the left side of each guard relay to the runner and stake lock relays RL and SL at left, they are energized, and that sets remedial action in train.]

Then (for example) the runner guard relay (RG) senses a dual runner signal, it energizes runner lock relay RL, closing contacts RG1 and RL1 and latching the relay at key RLK (which is released only by manual operation); the runner guard (orange) signal proceeds then to energize hold-up relay HU. That action pulls open contact HU4 and the LM solenoid is de-energized, setting the commutator-scanner bar in rapid rotation. Because the hold up circuitry keeps the contacts HU4 and HU5 open, the solenoid LM cannot be energized and the scanner does not respond to TIM bid signals (brown), and the "connect" signal (purple) CN terminates. A visible alarm-light RGL turns on. No ACK (green) signal returns to the TIM, the relay TC does not operate, and, in consequence, the latch on cam TCC does not lift, and control cam CMC rotates only to move the guide from the cam highpoint into the cam groove,

FPI—SS—3-17-72—30M—9153

opening contact CM2 and drawing it down to its lower, ground contact, grounding the connect (purple) signal line. A consequence is that TIM alarm lamp (TL), above and to left of the commutater, is lighted. The TIM is, in effect, locked up. The two alarm lights RGL and TL advise the maintenance staff of the kind of problem involved and of the TIM involved. If the difficulty is local to the TIM, that TIM can be taken out of service by manual operation of the TIK switch (seen just left of the lamp TL), and the data processor restored to service by manual operation of the runner lock key RLK; that key opens contact RL1 and deactivates the holdup circuit (HU), permitting the scanner and the other parts of the system to resume operation. If there is some other correctible fault, not disabling the TIM, then, after correction, the "cancel fault key" CFK, to the right of the three cams, is manually pressed down with the effect of closing contact CM1 and routing an activating signal which operates the cancel solenoid; that solenoid releases the latch holding the control cam CMC in arrest; rotation of cam CMC resets the TIM for resumed sales.

The functional or block diagram of Handley No.2,479,681, in the record as Exhibit BS, is a convenience in reading

FPI—SS—3-17-72—30M—9153

Handley against the claims of plaintiff's patent [Tr.2914-2925 (claim 20) 2925-2928 (claim 21), 2928-2932 (claim 22), 2937-2943 (claim 23), 2943-2951 (claim 24), 2951 (claim 25), 2951-2958 (claim 26), 2958 (claim 27), 3170-3264 (cross-examination)]. Much here depends on what the fair embrace of the claims is.

It can be said at once that claim 20, in the light of Handley's circuitry as just described, as seen in Exhibit BQII, and as summarized in Exhibit BS, can be read on Handley No. 2,479,681 with two qualifications. The first of these is the presence in claim element 20(B) of the phase "representing the particular" TIM, in referring to the signals generated in response to the "selected-transaction" signal. The meaning of the phrase, read against the Weida patent's disclosure (easiest seen in Annexes A and E), is at best uncertain, and, in any event, as used in Claim 20(B) relates only to the signals, not to any use made of the two fold nature of the signals (See Exhibit 11, 11A); the bid (brown), contact (purple), runner (blue) and stake (yellow) chain of signals does identify the TIM necessarily, although the identification is not used in any aggregation process. The second qualification is with reference to the null phrase at the end of claim element 20(C)

FPI—SS—3-17-72—30M—9153

"only if the transaction is correct." As explained above (pp.174-175) no content can be given to that phrase.

That Handley is essentially electromechanical and not an electronic digital processing system does not distinguish it. Plaintiff's patent is not on a new, unobviously new means of substituting EDP components in familiar racetrack circuitry. It does not limit its claims to EDP components. The patent claims in issue are systems claims, each consisting in a combination of inclusively indicated means that consist in reality of circuitry connecting conventional elements for conventional uses, the whole enacting an old scenario. The union of means claimed by Claim 20 is an unimaginative joining of the basic means of any aggregator of TIM data, means of picking up the wagers (or sales, or whatever the machines handle), adding them by classes (or performing some other calculation on them), and acknowledging (confirming) to the source that the calculation has been made. Handley does these things. His class aggregators are typified by the "1 and 2 combination counter" 39 and the total aggregator by the "total counter or register" 40.

FPI—SS—3-17-72—30M—9155

Claim 21 elaborates claim element 20(C), and includes claim elements 21(C) and 21(E), which refer to the reading-in and reading-out steps specific to a counting means that has to retrieve a number, increment it in a separate procedure and restore it to its "address." These elements are not present in Handley, which uses electromagnetic adders. If the claim is pointedly intended to be limited to a "memory" and "updater" aggregating means, it does not read on Handley. But so limited, the claim is empty of any vestige of patentable novelty. The Claim then adds nothing to Claim 20 except to put forward the idea that a "memory" and "updater" could be used as the means of element 20(C), which is self evident. Claim elements 21(A) through 21(B) are then seen as a single "means," specifying the use of an addressed memory and updater type of adder, and the Claim is reduced to nothing.

Claim 22, if read as requiring a register in one central place of the number of transactions at each TIM, and that the register be of the "memory" and "updater" type, does not read on Handley. Handley's register of the number of transactions is kept by stake classification at the TIM in the assembly called "cash counters." See Handley No. 2,479,681, Col. 1,

FPI—SS—3-17-72—30M—0153

lines 50-60, and cannot be derived from the runner and total aggregators. For reasons already explained, Claim 22 is of no moment.

Claim 23, relating to scratches, reads on Handley. True, Handley simply and directly picks off the forbidden signal at the "cancel relay" and uses it to close relay A or B and despatch the reject signal to the TIM. But to argue that Handley's is not a species of "comparing" means within claim element 23(C) is to reduce that claim to nothing; a "comparing means" in the strict sense of "a conventional equality comparator" (Exhibit 1, Col. 14, lines 35-36) serves no purpose except to determine that the signal is or is not wanted and to reject the mistaken signal; a glance at Figure 2 of the patent at once suggests that Handley's means are a full equivalent of the comparator of the patent. Hence, reading claim element 23(C) so narrowly as to make the entire claim turn on the precise use of a "comparator" to originate a scratch signal that produces a reject signal rather than a relay pick-off that uses the signal to energize a second relay to produce a reject signal narrows the entire claim to a trivial specificity which denies any originality to the claim as

whole. As pointed out earlier, no patentably new union of means is present in the claim, but the constriction of claim element 23(C) in an effort to save the claim from the challenge of complete anticipation trivializes the claim and reveals its want of patentable novelty in the strongest light. The argument that Handley does not anticipate because of the mutual exclusiveness of function in relays AC and RC in the acknowledgement circuitry, and the consequent risk of erroneous ticket issue, does not reach the point of the present claim. The acknowledgement circuitry of Handley is not assured against certain conceivable errors, but it is a straightforward acknowledgement means operable in the generality of instances, and it fully responds to claim element 23(E).

Claims 24 and 25 relate to scanning means and means for stepping to the next TIM both when no wager is sensed, and after processing the wager when a wager signal has been sensed. Handley does provide scanning means of the required kind unless the scanning means must generate a TIM number, and unless Handley's nonstopping scan ignores sensed wager signals. But the claims do not in terms or in reason require that the scanning generate a TIM number. They require simply that the scan proceed from TIM to TIM for interrogation. Indeed, since the

FPI—SS—3-17-72—30M—0153

scan signal that reaches the TIMs of plaintiff's patent has been decoded by the scanner, it may be questioned whether its probable derivation from a TIM number signal has any functional relevance or significance at all in the ultimate interrogation of the TIM. Nor does the rotation of the scanning bar and its slowing (rather than stopping) at the active TIM under the influence of the LM solenoid result in a failure to "step" only when appropriate. The peripheral dimensions of the segments allotted to the TIMs and the speed control would, as of course, be measured to allow for a brush-contact time sufficient for the processing of any sensed transaction.

Claims 26 and 27 relate to aspects of the "error test routine" of plaintiff's patent. Exhibits 16, 16A and the testimony of the patentee Weida appear to confine plaintiff's view of Claims 26 and 27 to the functions centering on the "two entry transaction" unit THBA ("a conventional majority logical element") as distinguished from the means of detecting attempted wagers on scratched horses, centering on the "test for non-transaction" unit TFSA; Claim 26 is treated as including acknowledgement means where the wager is valid and rejection circuitry for the case in which erroneous entries are sensed.

FPI—SS—3-17-72—30M—9153

Claim 27 is treated as specifying the test for the attempted dual wager. The use of the plural "signals" in claim element 26(B) in contrast to the pointed use of the singular "signal" in claim element 26(A)(1) and 26(C) lends support to that reading.

The dual entry circuits (orange) of Handley respond to Claim 27 and claim element 26(B) in displaying means of detecting and acting upon dual entry and stake signals. Strictly, the operation of the Handley circuit locks out the TIM rather than simply rejects the transaction, and the TIM must be restored to action through operation of the cancel fault key. Where there is no dual entry, Handley does transmit an acknowledgement signal. The argument that the acknowledgement signal would arrive before the lockout system could function has no support except in a comparison of the number of relays in the error circuit with the number in the acknowledgement circuit, but operating times of relays differ and the times are not given in Handley's specification.

The detailed consideration of Handley demonstrates the overall absence of patentable novelty in the patent in suit. It brings out sharply the extent to which familiar circuits

FPI—SS—3-17-72—30M—9153

have long handled familiar tasks, and that the plaintiff's patentees brought no new discovery to the task but only a routine choice of familiar but newer means to replace the older ones of Handley in the same union of means. The union embraced in each claim Handley shows to be itself old, the asserted differences between Handley and the plaintiff's patent that plaintiff relies on, emphasizing differences in the means and not in the combinations or unions of means that, broadly, were equivalents, underline the want of novelty in the union of means - the combinations, on the patentable novelty of which validity absolutely depends.

The Aqueduct Totalizator System of 1960-1961, discussed by the witness Fosse in detail (see particularly, Tr1939-1954) and summarily by the witness Highleyman (Tr. 2959-2965), is most easily seen in Exhibits X and BT, and it is illustrated in terms of typical operating subsystems and components in Exhibit AA. It does not duplicate Handley, but like Handley exhibits unions of means embracing, as of course, TIMs, individual runner and total aggregators, scratch horse wager rejection means usable to detect and reject an effort to aggregate wagers on two runners on the same scan, scanning means, and acknowledgement means. The Aqueduct totalizator

FPI—SS—3-17-72—30M—9153

did not have means to record the number of bets placed at each TIM and, thus, could not be said to respond to Claim 22. Like Handley, it does not exhibit claim elements 21(C) and 21(E), but the point of claim elements 21(A) through 21(E) is simply to state "aggregator means," and such means the Aqueduct totalizator possessed, as did Handley. Again, as in the case of Handley, the Aqueduct totalizator illustrates the absence of any novelty in plaintiff's claimed unions of familiar means to perform their usual functions with their usual effect in a simply additive way. That the Aqueduct totalizator is closely related to Lange No. 3,051,384, cited in the patent office, does, indeed, signify that the patent office granted the patent over Lange, and that, therefore, the patent is entitled to a presumption of validity over Lange. But the presumption evaporates when the patent is scrutinized in the light of Handley (cited in Lange) and the Aqueduct totalizator itself. The facility with which the patent was issued remains inexplicable.

Except that it uses a good many electronic components, it is not suggested that Wright No. 2,837,281 (Exhibit BQ-2) displays as clearly as Handley and the Aqueduct totalizator

FPI—SS—3-17-72—30M—9153

the defining characteristics of Claims 20-27 of plaintiff's patent, in some part, it would seem, because the subject matter of the patent did not require a total elaboration in the specification of the system involved. Hence the reading of the claims on Wright's disclosure is imperfect, and Wright inures as an additional but more general evidence that the plaintiff's patent does not present patentable novelty or any patentably novel union of means but mere difference without advance. The same must be said of Faulkner No. 2,987,250 (Exhibit BQ-3), an "electronic totalizer" displaying a "sequential" scanner, plural TIMs, runner and totals aggregators with "memories" and "updating" means, and acknowledgement means. Reach No.3,063,036 (Exhibit BQ-4) is dilutedly like Faulkner and of the same species as Schrimpf (Exhibit 3A), which was so inadequately dealt with in the patent office. The other prior art discussed in posttrial briefs and proposed findings is remoter in terms of claim reading but all contribute something to the demonstration that plaintiff's patent presents, simply, one modest example of the wealth of suggested means of converting such data processing systems as racetrack parimutuel systems to the use of electronic components without presenting any patentable advance over the existing art or commercially available means of adaptation.

FPI—SS—3-17-72—30M—9153

VIII

The issues of infringement have not played a prominent place in the case, in part, no doubt because the seeming breadth of claims 20-27, and plaintiff's reliance on Section 112, third paragraph, left meaning somewhat at large, to roam and pounce. See, e.g., defendant's proposed finding 124 and plaintiff's approach in its proposed findings 8.1 and 8.13. But in the end, defendant puts forward only its proposed findings 127 (the number of the claim is misprinted; defendant means Claim 24) and 128.

A. The argument that the accused devices do not involve periodical and sequential scanning means within the meaning of claim element 24 must fail. The gist of the defense argument is that in the device of the patent a STEP signal from the step pulse generator STP (Fig.3) (which is started up by console signal ICL) sets the scan counter SKA at one or increments the scan counter SKA (Fig.2) by one, and so causes the scan counter to feed an SKNA signal to scanner SCA, which decodes it and sends it as signal SCNNA to the interface (IFN) of the first (or the next) of the TIMs N. If the TIM has a transaction ready, as manifested by a depressed key and the TIM generation

FPI—3S—3-17-72—30M—9153

of BID N signal, the signal at the TIM (now SCNN) crosses the switch, closed in response to the depressing of the TIM key, and "is fed out as a selected transaction signal" HNN to buffer NA, and then is processed. If TIM N is not ready with a transaction, what really occurs is a little obscure (Exhibit 1, Col. 4, lines 40-45), but the specification states that if no transaction switch was "latched the STEP signal was generated. Therefore, this is the method of stepping over [TIMs] which are not prepared to perform a transaction." The SCNNA signal from the scanner SCA is the interrogation signal (Exhibit 1, Col.3, lines 44-45). In any case, plaintiff's scanner presents each TIM in numerical order with the opportunity to connect for service and connects for service with TIMs in their numerical order. Since it sweeps over a large number of TIMs cyclically it does not take up bids for service in the time order in which the bids for service are put up but in number sequence by cycles. That is, if TIM 50 gets its bid up before the scan passes it is served when the scan reaches it even though TIM 80's bid may have been made an instant sooner. So too, if the scan is at TIM 50 when TIM 49 puts up its bid, TIM 49 must wait until the scan completes the cycle, serving TIMs all of which may have bid later than TIM 49. The cycles are so frequent that no practical

FPI—SS—3-17-72—30M—9153

delay is present, the patent assumes.

The accused TIM scanning system common to both accused devices is easiest seen in the sketch, Exhibit BU, of the "NYRA Cascade Scanners." It will be seen that while each TIM scanner scans its group of fifty TIMs "sequentially" in the same sense of that word that applies to plaintiff's scan, and the master scanner scans the TIM scanners "sequentially" in that same sense of the word, the order in which the TIMs are served will be a complex sequence. If a letter is assigned to each TIM to reflect its group, scan will always be, it seems, in the order An, Bx ... Ly; but, although the numbers will seem random, they will be ordered within each letter group. That is, using groups of six and four letter groups for simplicity, the order could be:

A1	2	3	4	
B 12,	7	8	9	
C 15,	16	17	18	
D	20	21	22	23

	1, 12, 15, 20,	2, 7, 16, 21,	3, 8, 17, 22,	4, 9, 18, 23
A	5	6	1	2
B	10	11	12	7
C	13	14	15	16
D	24	19	20	21
	5, 10, 13, 24,	6, 11, 14, 19,	1, 12, 15, 20,	2, 7, 16, 21

FPI—SS—3-17-72—30M—9153

The sequences shown assume that every TIM is always ready with a bid when reached by its scanner; that is a condition to which the scan system must be equal, but it is not an intrinsically necessary condition. The service sequence is logically the same, although more numerically obscure since there will be skipped numbers, but never skipped bidding numbers, in one or more groups; every TIM ready with a bid will be served within its group in number sequence within the cycle of its TIM, for no scanner is adapted to pass a bid or to relinquish the TIM connection until service is complete, at which point it scans on to the next bid in sequence and initiates service.

Do the accused systems, then, include "scanning means for sequentially and periodically selecting each of the TIMs for interrogation"? Each TIM is scanned sequentially by its scanner and, within each group, bidding TIMs are served sequentially. That a dozen scanners are seeking service at common aggregators so that they too must feed their collected selection signals through another collector in that collector's sequence does not signify that the TIMs have not all been scanned sequentially. It signifies only that the complex ordering of the servicing obscures the sequences of scan and service.

That the scan is never "periodical" in one sense, since scanner's dwell-time is longer at bidding TIMs than at inactive TIMs, does not mean that the term defeats the claim element and makes infringement impossible. It is periodical in the sense of occurring in a regularly repetitive cyclical pattern that is uninterrupted. The "period" of scan is once every cycle.

B. Defendant strongly urges as its general infringement defense to Claims 20-27 that the reading of the claims on the accused devices depends critically on finding that the general-purpose computers used in the accused systems execute the functions of the "means" of the plaintiff's claim elements through use of stored "programs." Plaintiff, it is contended, seeks to find infringement in defendant's method of using a completely non-infringing general purpose machine. Defendant puts it:

> "Simply stated, the basic issue posed is whether an apparatus claim for a combination of old elements (as distinguished from a process claim) can be infringed where the recited elements
>
> - exist only in sequenced transitory states through the interaction of sequentially operative software "program" instructions with elements of available standardized and multifunctional circuitry, and
> - do not coexist as physically identifiable entities at any given instant of time."

Plaintiff answers that, without stored programs a general purpose data processor is useless; that a data processor physically stores a program as a physical condition of the processor - the physically stored program endows the data processor as a machine with the capability of functioning in particular ways, converts it into a physical means of performing that function. The general purpose processor, therefore, plaintiff appears to argue, embodies physically, if temporarily, the unions of means of the patent claims in suit; that it can accept many other programs and embody physically many other unions of means that do not infringe, plaintiff appears to argue, is beside the point - infringement need not be the necessary and inevitable effect of every operation of the general purpose computer: it infringes when it physically harbors in its memory cores, flip-flops, etc., the stored signals, magnetic states, etc., which make it an operable assemblage of physical means of performing the set of functions which the system or device of the claim is dedicated to performing. Putting aside Gottschalk v. Benson, 1972, 409 U.S. 63, as dealing with a "software" program for solving a mathematical formula on an existing computer, plaintiff invokes Application of Knowlton, C.C.P.A. 1973, 481 F.2d 1357, 1368,

FPI—SS—3-17-72—30M—9153

and could invoke Application of Johnston, C.C.P.A. 1974, 502 F.2d 765, 771, in which the Court said:

> "Record-keeping machine systems are clearly within the 'technological arts.' Such machine systems, which comprise programmed digital computers, are statutory subject matter under the provisions of § 101, and 'claims defining them must be judged for patentability in light of the prior art.'"

Certiorari was granted in Johnston on May 12, 1975, sub nom. Dann v. Johnston, 44 L.W. 3042. Application of Bernhart, C.C.P.A. 1969, 417 F.2d 1395, 1400, relied on in Knowlton and Johnston, had said:

> "... if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without the program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed. If a new machine has not been invented, certainly a 'new and useful improvement' of the unprogrammed machine has been ...."

Judge Rich, dissenting in Johnston, pointed out that Benson, denying patentability to a novel program as a method, implied that the result would be the same if the claims had been cast in machine form (502 F.2d at 773).

Defendant attacks the plaintiff's argument with the classic differentiation between machine and process claims,

FPI—S8—3-17-72—30M—9153

emphasizing that a process is a mode of acting, an act or series of acts. Tilghman v. Proctor, 1881, 102 U.S. 707, 722; Expanded Metal Co. v. Bradford, 1909, 214 U.S. 366, 384 (quoting Cochrane v. Deener, 1877, 94 U.S. 780, 787.) Defendant argues, too, that there cannot be infringement of a product claim on a combination of functional means unless the several means in the thing or things or acts accused of infringement are co-existent things that coact to achieve the union function of the combination of means put forth in the patent claim. Cf. Beecher Mfg. Co. v. Atwater Mfg. Co., 1885, 114 U.S. 523 (claim on "the series of dies" [both old] "for forming clip kingbolts"; the dies were to be used successively, and, when so used, in a heat process, the first gave shape to the bolt wings, and then the second, in a separate step, bent the pre-shaped wings to a desired curve; results separate, dies not combined in one machine, "did not co-operate to one result"; no patentable combination). (Many years ago 1 Robinson, Patents, 1890, § 173, p. 257, defined a "machine" as "an artificial organism, governed by a permanent artificial rule of action, receiving crude mechanical force from the motive power, and multiplying, or transforming, or transmitting it, according to the mode established by that rule.")

FPI—SS—3-17-72—30M—9153

There is no logical defect in plaintiff's argument, nor is the risk unreal that to yield to plaintiff's argument will confuse process with article inventions and open a new order of difficulties in differentiating process from abstract principle. Cf. Waxham v. Smith, 1935, 294 U.S. 20, 21-22. Benson, certainly, dealt with what was put as a process claim, but the Court was aware that, "Some of the digits are stored as components of the computer." 409 U.S. at 65, underlining added. The Court knew it was dealing with a method of implementing a general - purpose digital computer to perform the task of converting binary-coded decimal numerals into pure binary numerals by installing in and feeding to it a congeries of electric impulses, magnetized spots, and charged spots on cathode-ray tube screens. Yet the Court said (409 U.S.at 71), "... one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary nnmerals were patented in this case." Noting that the formula was of no utility except for EDP roles, the Court said that to validate the patent would pre-empt the algorithm itself. Nevertheless the Court cautioned that Benson was not to be read as precluding a patent "for any program servicing a computer."

PPI—SS—3-17-72--30M—9153

What Benson says does not dispel uncertainty, but it lends enough light to see to the conclusion that a combination of means claim comprising a machine system is not infringed by another machine system which does not as a permanent machine system include the same combination of means, and which performs the function to which the patented combination of means is addressed only when its general-purpose digital computer element is "instructed" - programmed - in the processing of the type of raw data that is to be fed to it. It is not the computer - the machine qua computer - that performs the function, but, rather, the machine function of the patent is attained only through "use" of the general-purpose computer. The general-purpose digital computer is itself a total and self-complete machine entity. Versatility in electronic data processing is its endownment, its reason for being, its stock in trade. When it is programmed to do what the system of plaintiff's product patent is capable of doing by machine means, it is not infringing the machine patent, for the patent is on a specific set of machine means, their making, use or vending; the patentability of the combinations of means for performing, inter alia, the tasks of a racetrack pari-mutuel

system, if they had been patentable, would reside in the unobvious novelty of its combinations of machine means for doing the tasks. The programmed general-purpose digital computer does not so do the racetrack job; it does the same tasks but not by the same or equivalent machine means. Rather, it performs the tasks - putting it most favorably to plaintiff - by a new use of a known machine, and that is a process under 35 U.S.C. 100(b).

It is concluded that the accused devices do not infringe Claims 20-27.

IX

The wholly unsatisfactory processing of the patent application in the Patent Office is compounded by want of total disclosure on the plaintiff's part of the antecedents of the first totalisator and of the patent application. But the evidence does not support a finding that there was conscious wrongdoing or witting non-disclosure of what plaintiff knew or should have known was germane to the prosecution of the application. A too cavalier assumption that plaintiff could farm out to Spiecens the job of preparing a hurried application that could be filed and wrangled out later on in the Patent

FPI—SS—3-17-72—30M—9153

Office there may have been. There was a chilling disregard of the principle that it is individual human inventorship only that the patent law recognizes and not corporate ownership of technical talent and the technical men's derisory "rights" to file for patents on their inventions. Here, the evidence is that Spiecens dealt with the "inventors" orally, worked from shop drawings, schematics, block diagrams etc., and, evidently, neither felt that he had to, nor did dig into the background. He was filing on the system just completed, and the walkover prosecution did not occasion any return for client conferences that would have exposed the roots of the system his specification described and his claims outlined. It does not appear that Leonard or Weida or any management personnel withheld anything against Spiecens's inquiry or suppressed anything which Spiecens thought he needed or which management feared might become a threat to successful prosecution. The overall impression is that the filing was not a matter to which management attached any importance or to which it adverted after authorizing the filing. The conscious misdealing with the Patent Office or the reckless neglect of disclosure responsibilities required by the authorities were not present. Cf. Carter-Wallace, Inc. v. Davis-Edwards Pharmacal Corp., 2d Cir. 1971, 443 F.2d 867, 881-883,

FPI—SS—3-17-72—30M—9153

It is, therefore, concluded that the patent was not obtained through any fraud on the patent office, and, that, although plaintiff's management of the prosecution was characterized by a foolish unconcern, a want of proper managerial and technical supervision, and an improperly broad delegation of responsibility to an inadequately instructed patent solicitor, plaintiff did not act in bad faith in prosecuting the patent as it did, or consciously breach its duty to the patent office.

It follows that the case is not within Walker Process Equipment, Inc. v. Food Machinery & Chemical Corp., 1965, 382 U.S. 172.

There remains the question whether defendants are entitled to reasonable attorneys fees under 35 U.S.C. 285. The case has been pending for about eight years and the trial consumed twenty-five days. Nevertheless it cannot be said that the case was pursued in bad faith, or was so wholly devoid of substance that plaintiff could not fairly be supposed to be proceeding in good faith. Cf. Kahn v. Dynamics Corp. of America, 2d Cir. 1975, 508 F.2d 939, 944. It may be difficult to believe that plaintiff could have thought, or have persuaded its experienced counsel, that the patent reflected any

FPI—SS—3-17-72—30M—9153

technical or practical advance of any importance. The descent of the case to a hollow reliance on Claim 22 as the most important claim and on claim element 20(B) as a matter of unobvious novelty betrays the slightness of the patent and the tenuousness of the claim that it discloses patentable subject matter. But none of that makes the case one within Section 285. And had the patent and the pendency of the case imposed any substantial constraint on Atusa's trading, the long sleep of the case in the discovery phase, for the supervision of which the late Judge Rosling had referred it to one of the Court's Magistrates, would not have been suffered to continue.

X

Separate supplemental findings have been made, but the present Memorandum contains the greater part of the findings of fact.

The formal order for judgment is incorporated in the same document with the findings of fact. Judgment is for the defendants.

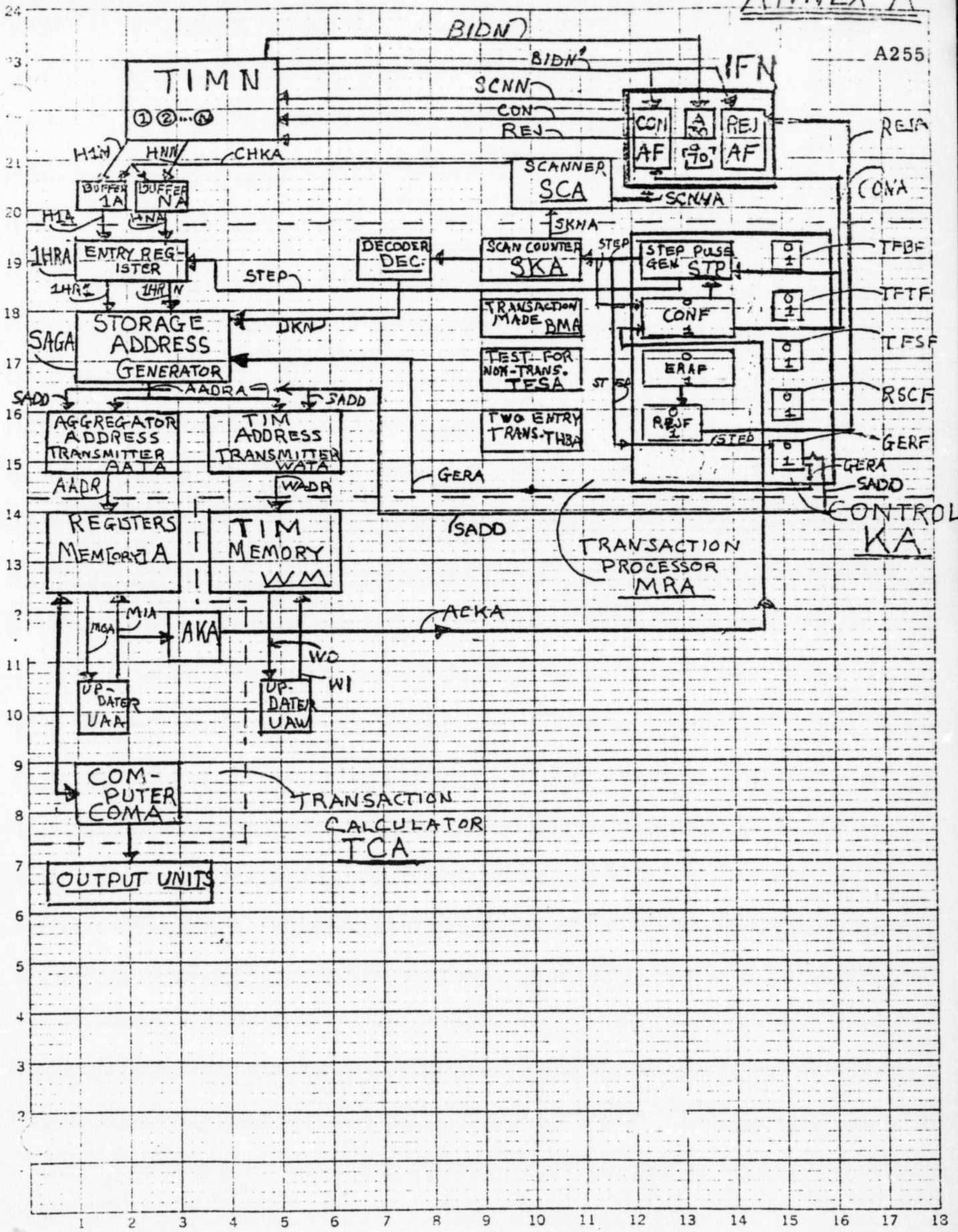
It is so ORDERED.

Brooklyn, New York
September 16,1975.

U. S. D. J.

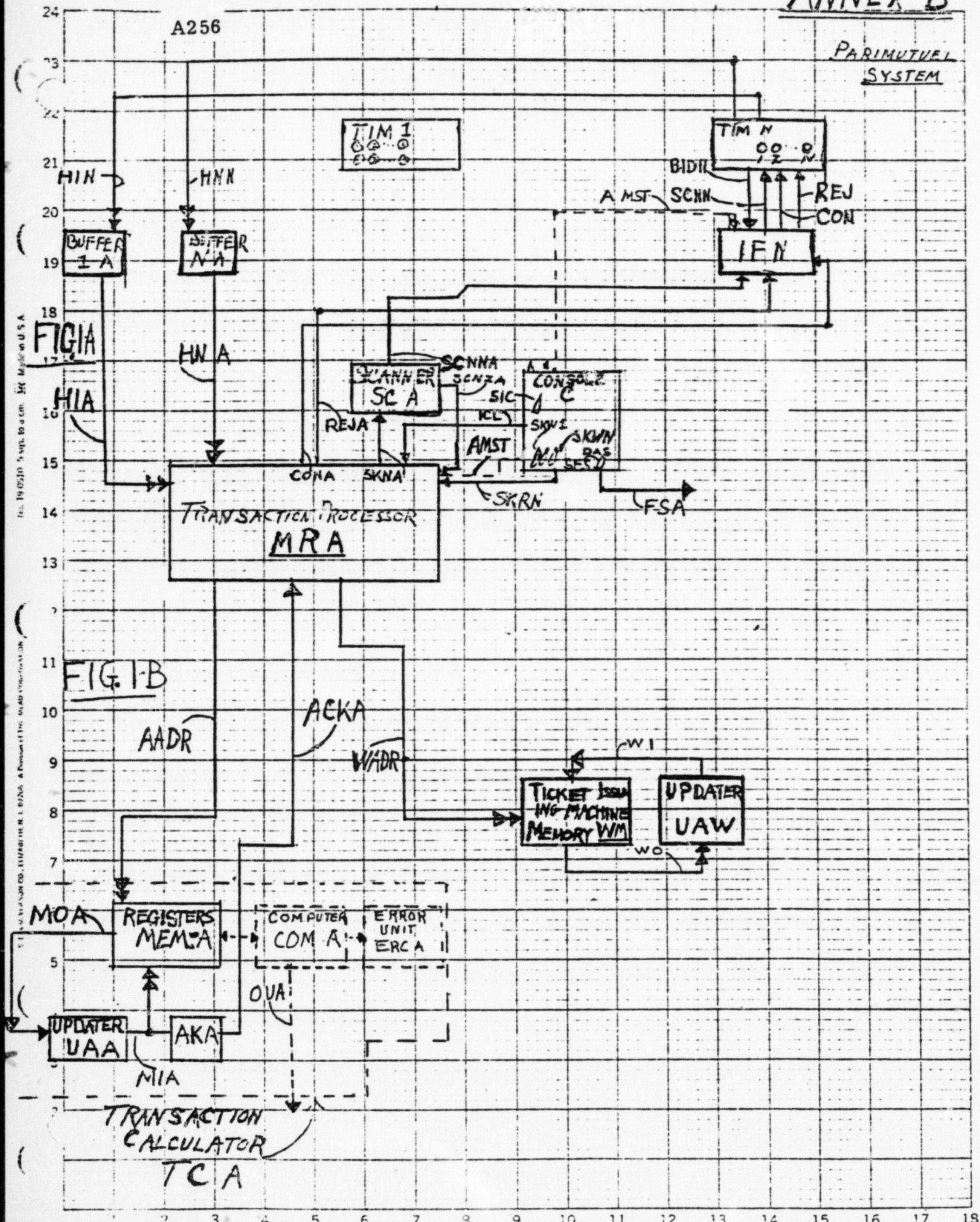
FPI—SS—3-17-72—30M—9153

ANNEX A


A255
BIDN
BIDN'
IFN
SCNN
CON
REJ
TIMN
1 2 ... N
H1N
HNN
CHKA
BUFFER 1A
BUFFER NA
H1A
HNA
SCANNER SCA
SCNA
SKNA
1HRA
ENTRY REGISTER
DECODER DEC.
SCAN COUNTER SKA
STEP
STEP PULSE GEN STP
TFBF
TFTF
TFSF
RSCF
GERF
GERA
CONF
ERAF
REJF
ISTEP
TRANSACTION MADE BMA
TEST FOR NON-TRANS. TESA
TWO ENTRY TRANS. THBA
STORAGE ADDRESS GENERATOR
SAGA
AADRA
SADD
DKN
AGGREGATOR ADDRESS TRANSMITTER AATA
TIM ADDRESS TRANSMITTER WATA
AADR
WADR
REGISTERS MEMORY A
TIM MEMORY WM
TRANSACTION PROCESSOR MRA
CONTROL KA
ACKA
MGA
MIA
AKA
WO
W1
UP-DATER UAA
UP-DATER UAW
COM-PUTER COMA
TRANSACTION CALCULATOR TCA
OUTPUT UNITS

ANNEX B

PARIMUTUEL SYSTEM



ANNEX C

A257

CONTROL KA

FIG. 3

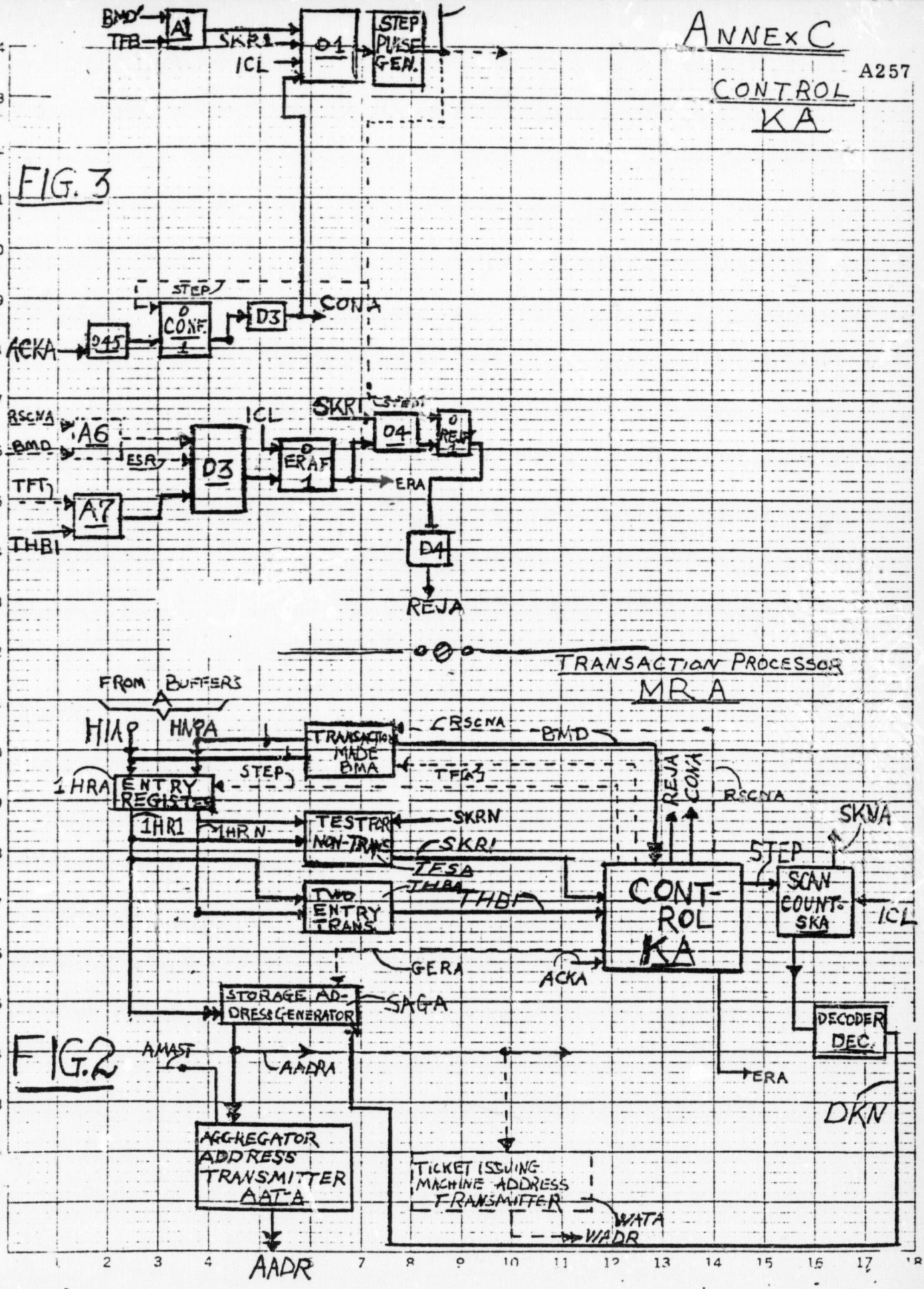
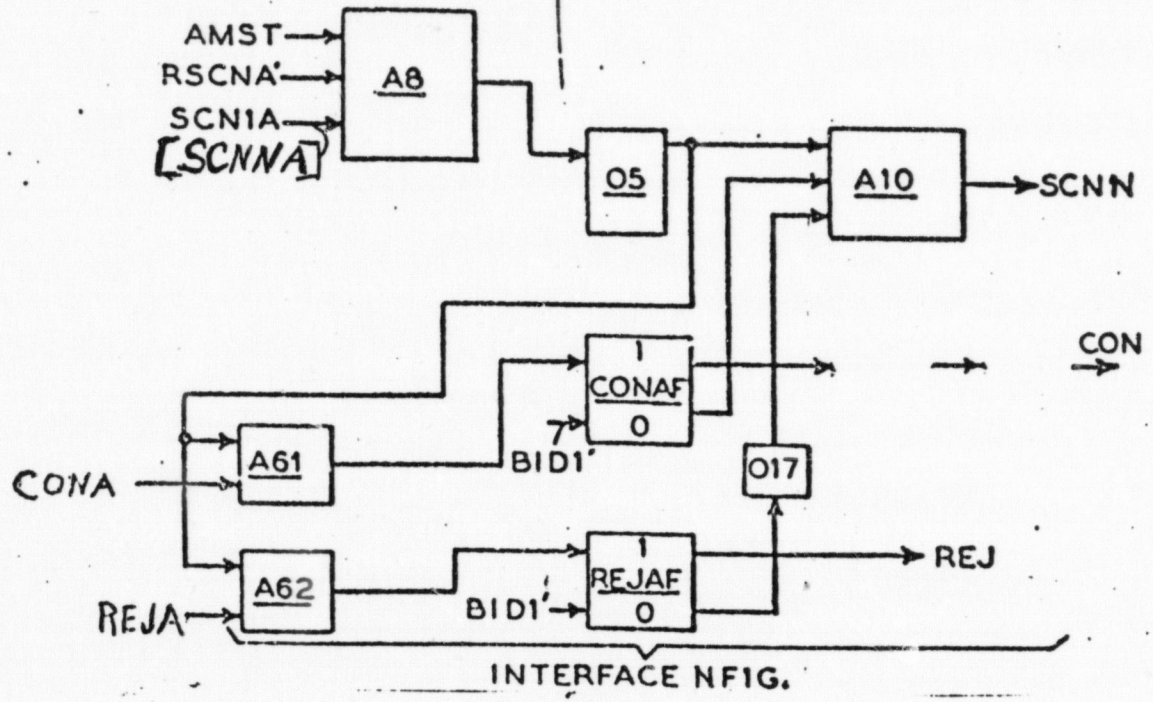


FIG. 2

FIG. 4 (See Col. 8, ll. 37-43)



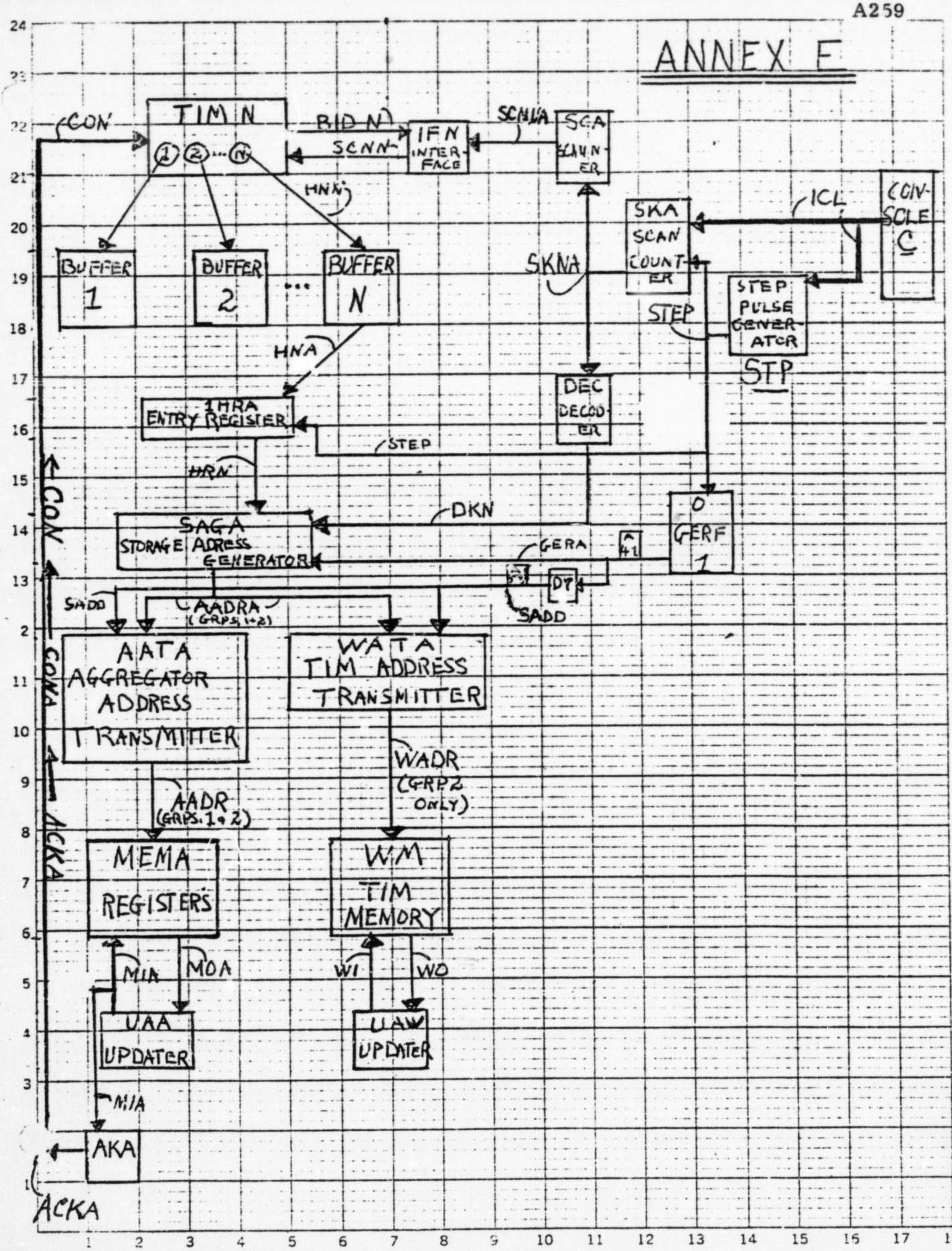
Circ 05 At A10, SCNN substituted for SCN1, since single wager, not daily double, involved.

BY INVENTOR

INTERFACE IFN

ANNEX D

ANNEX F


TIM N
1 2 ... N
CON
BID N
SCNN
IFN INTER-FACE
SCNA
SCA SCANNER
HNN
BUFFER 1
BUFFER 2
BUFFER N
HNA
SKA SCAN COUNTER
SKNA
ICL
CON-SOLE C
STEP
STEP PULSE GENERATOR
STP
DEC DECODER
IHRA ENTRY REGISTER
STEP
IHRN
CON
SAGA STORAGE ADDRESS GENERATOR
DKN
GERA
41
0 GERF 1
DT
SADD
SADD
AADRA (GRPS. 1+2)
AATA AGGREGATOR ADDRESS TRANSMITTER
WATA TIM ADDRESS TRANSMITTER
CONA
WADR (GRP 2 ONLY)
AADR (GRPS. 1+2)
ACKA
MEMA REGISTERS
WIM TIM MEMORY
MIA
MOA
WI
WO
UAA UPDATER
UAW UPDATER
MIA
AKA
ACKA

ANNEX F

The language of the specification relating to the plaintiff's Post trial brief argument made at pages 6 - 8 is the following, paraphrased and interpolated only to the extent necessary to make comprehending reading possible.

This invention pertains to data processing systems and more particularly, to systems for processing data received from TIMs.

It is a general object of one aspect of the invention to provide a high speed scanning means for interrogating a plurality of relatively slow operating TIMs for transactions.

Briefly, in accordance with this aspect of the invention, scanning means are provided for sequentially and periodically selecting each of the TIMs for interrogation. Interrogating means transmit an interrogation signal to the selected TIM. If the selected TIM is prepared to make a transaction, it will transmit a selected transaction signal, e.g. HNN, meaning key N has been depressed on TIM N to signify that a better has placed a wager on horse N at TIM N. Means sense for the transmission of the selected transaction signal, which,

FPI—SS—3-17-72—30M—9153

if not sensed, causes the scanning means (SKA? or SCA?) immediately to step to another TIM for interrogation

The system includes a plurality of TIMs which accept transactions on entries in a contest. The transactions are operated upon by a data processor (Figure 1A, 1B). The data processor includes a Console and units such as scanner SCA, buffers 1A, 2A ... NA, a transaction processor MRA and a transaction calculator TCA.

The transaction calculator TCA includes a plurality of registers, a portion of which are aggregator registers, aggregated transaction updating means, a computer, and an acknowledge unit.

A switch in the console C will generate a signal C fed to the transaction processor MRA and the transaction calculator TCA as well as to the interfaces IF1, IF2 ... IFN, so that scanner SCA will control (execute) the sequential and periodic interrogation of the TIMs 1 to N. The transaction processor MRA will process a transaction, that is, check for erroneous transactions and other internally generated errors, and generate storage addresses for the memory positions in the TIM memory whose contents are to be updated and also the addresses of the aggregator registers in the transaction

calculator TCA whose contents (the aggregated transactions) are to be updated. The processed transaction information from transaction processor MRA is fed to the transaction calculator TCA which operates on the processed transaction information to calculate odds, pools, pay-offs and similar information.

All units are connected by signal lines which transfer signals between the units. Signal lines bear the same reference characters as the signals on the lines, so that when only a signal is mentioned, the signal line is implied, and vice versa. Some signals are shown in a single line for convenience although they are a plurality of lines in a cable. Typical examples are AADR, WADR, MOA, MIA, and SKNA. The lines shown in the figures indicate only one polarity of the signal such as the BID 1 signal. However, concurrent with this signal line, there are instances where a parallel line carries the opposite polarity of this, such as the BID 1' signal.

By momentarily depressing the initial clear switch SIC on the console, the system is initially cleared (the ICL signal).

The console signal (AMST in dual operation) fed to the interface of each TIM sensitizes these units to interrogating signals such as SCNNA signal from the scanner SCA, and the

same signal, fed to the transaction processor MRA, insures that storage address signals are fed from the transaction processor MRA to register MEMA and TIM memory WM. (Emphasis supplied.) Similarly, the console signal C is fed to transaction calculator TCA and, more specifically, to computer COMA.

The ICL signal fed to the transaction processor MRA presets the scan counter SKA to its initial count of 1. The output of scan counter SKA is fed as the SKNA signal from transaction processor MRA to scanner SCA. Scanner SCA decodes the signal SKNA and it becomes SCNNA and goes to interface IFN. If TIM N wishes to make a transaction, one of its transaction keys will have been depressed and a BIDN signal will be received by the interface IFN, which has no effect at this time. The scan is now at TIM N for interrogation. The SCNNA signal passes to TIM N as the SCNN signal and it is fed to the common side of all of the transaction-selection switches in TIM N. This signal will pass through to the other side of whichever selection switch is closed and will be fed out as a selected transaction signal, for example, HNN to the buffer for wagers on horse N, buffer NA. Depressing a key on the TIM causes the closing and latching of the associated transaction-selection switch so that the now transformed SCNNA signal, which has

become the HNN signal, is fed to buffer NA and thence to the entry register 1HRA in transaction processor MRA.

At the same time control KA (in MRA, Figs. 2,3) transmits a test-for-transaction-made signal TFB generated by flip-flop TFBF (Fig. 3) to probe transaction-made unit BMA. If a transaction has been made, as indicated by the presence of a signal such as HNN, a BMD signal is fed back to control KA. If no BMD is fed back, control KA generates a STEP signal to scan counter SKA which steps to the count of n + 1 to initiate the transaction interrogation of TIM N+1. It should be noted that the HNN signal was derived from the SCNNA signal passing through a latched transaction switch and if this switch (or another switch in TIM N) was not latched, the STEP signal would be generated. (Emphasis supplied.) Therefore, this is the method for stepping over TIMs which are not ready with a transaction. The STEP signal, when generated, is fed to scan counter SKA for stepping the scan to the next TIM, that is, TIM N+1. (Column 5, line 16).

After the completion of error test routines (testing to be sure that a bet has been made, that two bets are not being co-signaled, that a scratch is not being bet, and that there is

no false signal in the system) the coincidence of the reset signal, the no bet made signal, and a presently irrelevant signal at "and" unit A5 (Fig.3) sets the GERF flip-flop to 1. The GERA signal which is the output of the GERF flip-flop in its "1" state, strobes the storage address generator SAGA (Fig.2). The storage address generator SAGA is a plurality of "and" units each having one of its inputs connected to the GERA signal line and its other inputs connected to various combinations of one wager signal from entry register 1HRA (i.e., HR1 or HR2 ... or HRN) with a TIM identification signal DK1 or DK2 ... or DKN from decoder DEC, which decodes the signal from scan counter SKA.

The storage address register SAGA, in response to the GERA signal, transmits two groups of signals. (Emphasis supplied.) The first group, AADRA1 ... AADRAM, is associated with entry transactions (that is, at this part of the specification the "entry" keys are thought of as numbered from 1 to M); the second group of signals AADRAM+1 to AADRAN (signifying numbers of TIMs from 1 to N, apparently) are associated with the TIMs. These two groups of signals are grouped into a cable generalized as an AADRA signal.

After a presently irrelevant disparity check, a delayed GERA signal (Fig.3, unit D7), the SADD signal, is sent to both the aggregator address transmitter AATA and the TIM address transmitter WATA. Both the first and the second groups of the storage address signals AADRA pass through the aggregator address transmitter AATA to become the aggregator AADR signals. The second group of AADRA signals passes through the TIM transmitter WATA to become the memory position address WADR signals.

The aggregator address transmitter AATA is described in Boolean terms at Column 15, line 1 through 20. When the equation is simplified to drop the "B master" possibility, since the claims in suit deal with simplex operation, and the AMST signal, since it too relates to the"A master" operation, comes down simply to saying that the address is transmitted to the memory if the SADD signal is present. This applies equally to the group 1 and group 2 signals, that is, the address identifying the horse or entry on which the wager has been placed and the signal representing the TIM at which the wager was placed. The TIM address transmitter WATA equation, similarly, says simply that ————————————

the group 2 portion of the signal (indicating that an unspecified wager has been placed at the TIM) goes forward if the SADD signal is present.

In regular, that is, not daily-double wagering, the signal inputs of storage address generator SAGA include only the entry-identifying wagering signal which can be simplified to HR1, HR2 ... HRN signals and the DKN signals (that is, the TIM identification signals which are the output from decoder DEC) both of which will be included in the AADRA signals (Col. 7, lines 72-75). The AADR signal from aggregator address transmitter AATA is fed to register MEMA. The addressing circuitry there receives the aggregator address signals AADR to select the indicated aggregator register. The contents of the selected aggregator address are read out, recirculated and written back into the same selected aggregator register to update the number of transactions. In particular, for example, the AADR signals, when received by the aggregator register MEMA, select the column associated with the TIM and the row associated with the particular entry upon which a transaction is being made. The signals representing the accumulated number of transactions in that aggregator register are read out via

MOA signal lines to the updater UAA, where the count they represent is updated by 1, and then is fed back via the MIA lines to the original aggregator register in registers MEMA. At this time, registers MEMA feed an acknowledgement ACKA signal via amplifier AKA, indicating that the transaction has been recorded, to the control KA.

While the entry transaction is being aggregated, the specific TIM transaction is also aggregated. In particular, the WADR signal is fed to ticket issuing machine memory WM. The specific address memory position therein is selected in the manner described above for the registers MEMA, and the contents of that address memory position are read out on the WO signal lines and fed via the updater UAW and the WI signal lines back to the same address memory position in the ticket issuing machine memory WM. In this way, a central check is maintained on the number of transactions made by each TIM. For the sake of simplicity, there has been shown only an aggregation of the total transactions made by a ticket issuer. The routine can obviously be refined to indicate also the specific activity on each entry.

FPI—SS—3-17-72—30M—9153

The storage address generator SAGA, described in the instance of two entries for simplicity, satisfies two Boolean equations which in the light of Column 7, Lines 74 and 75, can be simplified from the form of Column 14, Lines 63 and following, so that for the group 1 signals the first expression is

$$\text{GERA} \cdot \text{HR1} = \text{AADRA1}$$
$$***$$
$$***$$
$$\text{GERA} \cdot \text{HRM} = \text{AADRAM}.$$

The second group of signals would respond to the following equations

$$\text{GERA} \cdot \text{DK1} = \text{AADRAM}+1$$
$$***$$
$$***$$
$$\text{GERA} \cdot \text{DKN} = \text{AADRAM}+N.$$

In group two, DK1, DK2 ... DKN imply the different outputs of decoder DEC which decodes the scan counter SKA signal.

It appears that the scan counter SKA is described in terms which indicate that when it is at TIM 1, it is at count 1, when it is at TIM 2, it is at count 2 and when it is at TIM N, it is at count N. When the scan counter SKA reaches a count that is one greater than the number of TIMs, it generates an all-TIMs check signal and then resets to a count of 1. Scan

FPI—SS—3-17-72—30M—9153

counter SKA is a chain of conventional cascaded binary counters. The scanners SCA and DEC are decoders which decode the combinations of 1's and 0's from the scan counter SKA. Hence the output from the scan counter SKA is identical in time, impulse and information at each "step" when it issues as signal SKNA to the scanner SCA and as an unnamed signal to the decoder DEC. In a word, it is the number of the TIM translated into binary notation.

The registers MEMA are a multiplane magnetic core matrix divided into rows and columns wherein the core in each plane in the same row and column provides a bit storage for a multibit binary number. A group of the registers (aggregator registers) is reserved for aggregating transactions. Other registers are reserved to store operation and result information of the computer COMA. Included with the registers are typical row and column selectors as well as read and write amplifiers.

Considering the aggregator registers, each row of matrix associated with the aggregator registers may be assigned to a different entry and each column to a different TIM. Therefore, the AADR signal lines are actually a plurality of lines divided into groups. The first group are lines associated with the outputs of the particular entry being made and are coupled

respectively to the rows. The second group are a plurality of lines associated with the TIM being processed. Of course, this can be refined so that each column is associated not with a particular TIM but instead with the same category of transaction. For example, in a horse race parimutuel system, one column can be associated with all $2 win bets, another column with all $10 place bets, etc. This is a simple matter since each TIM generally handles only one such type of bet. Under control of a read signal the bits of the number will be read out of the selected aggregator register as signals on the sense windings connected to the MOA signal lines, passed through a means for updating and returned to the same selected aggregator register under control of a write signal. Such recirculation type magnetic core matrices are well known.

The Boolean equation given for the acknowledge signal is essentially meaningless. It simply says that the read-back number signal after any updating serves also as the acknowledge signal to the TIM.

The TIM memory WM is a similar multi-plane magnetic core matrix and associated units, except that its matrix may be considered as having a single row. Of course, it can have

many rows each associated with different entries.

It should be noted that the registers MEMA feed data to the computer COMA, which in turn, feeds its result data to the output units of the system. The TIM memory is a dead end. No computations are performed on its stored data and they are not put to the output units. In other words, under the specification, no role is assigned to it except to record the number of wagers placed at that TIM.

The summary of the specification speaks of the data processor as comprising, inter alia: a scanning means under the control of step signals comprising (a) interrogating means for interrogating sequentially and periodically each TIM to determine if it is to perform a transaction as indicated by a latched transaction-selection switch and (b) transmitting means for transmitting to the latched switch of a TIM an interrogating signal from the scanning means; a plurality of buffer means each having (a) one input line connected to one of the associated output lines of each TIM, and (b) one output line for transmitting a particular transaction signal indicating that a transaction is desired on a particular one of the entries; sundry error checking and synchronizing means, not presently

relevant; generating means for generating storage address signals representing the entry associated with the particular transaction signal and representing the particular TIM under interrogation; transferring means for transferring such storage address signals as aggregator address signals; acknowledgement signal transmitting means for transmitting an acknowledgement signal to the interrogated TIM with the latched switch for issuing a ticket; a TIM memory comprising (a) a plurality of addressed memory positions each storing the number of transactions made by a TIM, (b) address-selection means for receiving the portion of the storage address signals generated by the transaction processing means for selecting the particular memory position associated with the TIM being interrogated, (c) reading means for reading out the contents of the selected memory position, (d) updating means for updating the read-out contents, and (e) returning means for returning the updated contents to the selected memory position; concurrently operating transaction calculating means comprising (a) register means having (i) addressed aggregation registers for storing the aggregation of transactions processed by the transaction processing means, and (ii) other registers for storing operation

FPI—SS—3-17-72—30M—9153

and result information, (b) means responsive to the storage address signals generated by said generating means for selecting the addressed aggregation registers represented by the storage address signals, (c) means for reading out the contents of said selected addressed aggregation register, (d) means for updating the contents of said selected addressed aggregation register, (e) means for returning said updated contents to said selected addressed aggregation register, and (f) means for generating an acknowledgement signal which is transferred to the acknowledgement signal responsive means of the interrogated TIM when said updated contents are returned to said selected addressed aggregator register. The "said generating means" referred to in discussing the register MEMA appears to refer back to the "generating means for generating storage address signals representing the entry associated with the particular transaction signal and representing the particular TIM under interrogation."

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

DIGITRONICS CORPORATION, NOW AMPEREX ELECTRONIC CORPORATION,	:	67 C 1119
Plaintiff,	:	FINDINGS of FACT and ORDER for JUDGMENT
-against-	:	
THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.,	:	
Defendants.	:	

The following facts are found, in supplementation of those in the MEMORANDUM and ORDER:

1. This Court has jurisdiction over the subject matter and parties.

2. Plaintiff, Digitronics Corporation, is a corporation of the State of Delaware. Plaintiff, Amperex Electronic Corporation, is a wholly owned subsidiary of North American Philips Corporation and is Digitronics's successor in interest.

3. Defendant, New York Racing Association, Inc., (hereinafter "NYRA") is a corporation of the State of New York and has a regular established place of business within the Eastern District of New York.

FPI--SS—3-17-72—5M--0153

4. Defendant, Automatic Totalisators (U.S.A.) Ltd., is a corporation of New South Wales, Australia, and is a wholly owned subsidiary of defendant Automatic Totalisators Ltd.

5. Defendant, Automatic Totalisators Ltd., is a corporation of New South Wales, Australia.

6. Defendant Premier Equipment Proprietary Ltd. is a corporation of New South Wales, Australia, having a regular and established place of business within the Eastern District of New York and is a wholly owned subsidiary of defendant Automatic Totalisators Ltd. Defendants other than NYRA, united in interest, are hereafter referred to as Atusa.

7. U.S. Patent No. 3,252,149 in suit was issued to plaintiff Digitronics Corporation on May 17, 1966 as assignee of the named inventors Robert L. Weida, Edward M. Richards, Evelyn Berezin, Jack Knoll and Philip Rosenblatt thereof.

8. The application for the Weida et al. patent was filed March 28, 1963. The critical statutory bar date under 35 U.S.C. 102(b) is, therefore, March 28, 1962 (i.e., date of invention was patented or described in a printed publication in this or a foreign country or in public use or sale in this country).

FPI—SS—3-17-72—3021—9153

9. Claims 1-19, and 28-33 of U.S. Patent No.3,252,149 have not been infringed by defendants, it was admitted at the commencement of trial, and they are not in issue.

10. The validity and infringement of "systems" claims 20 through 27 are here in issue; no evidence was presented to support or challenge the validity of any other claims.

11. Plaintiff conceded that claim 20 is the "heart" of the patented totalisator system and is the dominating claim.

12. Claim 22 is put forward by plaintiff as the most important claim; plaintiff puts forward as useful and unobviously novel the alleged combination of TIM number signal generation, TIM memory and electronic digital means.

13. Parimutuel betting is a system of wagering for multi-entrant events, such as horse racing. The wagers on each entrant for each "place" ("win", "place," "show") are accumulated in separate pools; the betting odds and consequent payoffs on the entrants that "place"(run first, second or third) are determined by the ratios of the total amounts wagered on each (less tax and track's percentage) of the "placing" entrants to the total amounts wagered on all the entrants for that "place."

14. Parimutuel "totalisators," whether manual,mechanical,

FPI—SS—3-17-72—30M—9153

electromechanical or electronic, are data processing systems.

15. The term "totalisator" connotes a system for automatically totalling bets entered on key-operated ticket issuing machines (TIMs) on runners in a race in order to account for the wagers, and compute payoffs and other betting results promptly after the announcement of the race result.

16. Atusa was early in the totalisator field, claims credit for coining the word and claims a large share in the development of totalisators since the first mechanical ticketing device. Atusa developed a practical mechanical totalisator ("tote"), which was put into use in 1917, an electromechanical totalisator in 1917, a multiple pool tote in 1923 and an automatic odds tote in 1927.

17. Totalisator systems for automatically performing the necessary accumulation of individual wagers on the entries, accumulating the total amounts wagered on all entries and making the necessary related calculations for parimutuel betting operations have been in use in this country since as early as 1933.

18. Atusa's first installation in this country was at Hialeah in 1932; a year later that system was sold to a group

FPI—SS—3-17-72—10M—9153

which later formed the American Totalisator Company (AmTote).

19. In 1933, AmTote installed at Arlington Park, Chicago a totalisator with a public display of the betting figures which were accurate to the dollar.

20. Over the years AmTote personnel have received and assigned to AmTote, or it has otherwise acquired, patents on totalisators, including

A. No.2,182,875 on a totalizing system including a stepping switch collector or scanner which operates only on TIM signal;

B. No.2,179,698 on an electromechanical totalizing system featuring a "jumping jack" collector or scanner; and

C. No. 2,557,384 on a mixed electromechanical and electronic totalizer using a vacuum tube decade (not binary) counter and electromechanical "pulse commutators"; it used stepping "relay" aggregators;

D. No. 2,563,041 on an electromechanical totalizator system with multichannel adding machines;

E. No. 2,652,977 on an analog odds computer for use integrally in an electromechanical totalizator;

F. No. 3,051,384 on a totalizator system (Lange, cited in the patent in suit);

G. No. 3,080,114, a further Lange patent on an improved totalizator system.

21. AmTote designed and tested an electronic totalizator around 1945, but it was not rugged or reliable enough to put into practical use.

22. Electronic data processing is inherently many fold faster than electromechanical or mechanical or manual data processing; since transistors and other semi-conductors have become available, electronic data processing components have become extremely compact; no patentable novelty resides in the decision to convert to solid state electronic data processing from one of the slower and larger systems, and to adapt familiar functions and circuits to the use of electronic components is obvious; the economies of time, space, power consumption and related costs resulting from the substitution of electronic components of a data processing system for electromechanical or mechanical systems are attributes of solid state electronics broadly, and do not make obvious modes of using electronic devices in familiar systems patentably new and useful on the basis of the resulting achievement of the familiar economies common to all solid state data processing systems.

FPI—SS—3-17-72—30M—9153

23. The demands of a racetrack parimutuel system on data processing resources are modest: the arithmetic calculations required are rudimentary; the range of input data is narrow, and the data are simple and easily translated into binary terms; no elaborated long-term memory is requisite; programming is simple and direct, and much of it is reducible to permanent wiring of system components; pre-existing electromechanical circuitry readily supplies patterns ~~and~~ which are in considerable part directly adaptable to solid state electronic data processing; the service demands on data processing systems of a racetrack parimutuel system present no identifiable difference of technical significance from those of other multiple input situations.

24. The totalisator systems installed and in operation at the Aqueduct and Roosevelt race tracks in 1961 were American Totalisator Model 7J systems. Such systems were essentially electromechanical in nature employing electrical relay circuitry and electrically operable rotary stepper switches. Such systems also included certain electronic data processing adjuncts and were generally representative of conventional American Totalisator construction and mode of operation at that time.

FPI—SS—3-17-72—30M—9153

25. The 1961 Aqueduct totalisator system included:

a) about 500 key operable ticket issuing machines of standardized construction,

b) electromechanical aggregators for accumulating the amounts wagered on each entry in a race,

c) electromechanical aggregators for accumulating the total amounts bet on all entries in a race,

d) an electromechanical scanner for connecting ticket issuing machines wanting to place a bet to the aggregators,

e) electrically operable display boards at various locations for the display of entry, odds and payoff information and the like,

f) an "Automatic Observer" for checking accuracy of displayed information,

g) an analog computer for calculating probable odds, and

h) a solid state electronic digital price computer for calculating payoffs, all electrically interconnected to provide for information transfer between components thereof and periodic updating and display of necessary information.

26. The 1961 Aqueduct totalisator system included electronic solid state digital data processing equipment as an operating component thereof.

27. The ticket issuing machines (i.e., TIMs) utilized at Aqueduct in 1961 were of conventional construction and included:

(1) a plurality of selectively actuatable and latching transaction selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) an acknolwledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch, and

(3) a rejection signal responsive means for unlatching latched switches relating to a scratched entry.

28. The totalisator system utilized at Aqueduct in 1961 included provision for automatically rejecting wagers on scratched horses with accompanying release of latched TIM switches and for checking input data for other errors.

29. The TIMs included in the totalisator system utilized at Aqueduct in 1961 included memory devices for recording the bets made on each entry in each race, pursuant to New York State requirements.

30. Prior to 1960 AmTote serviced approximately 200 racing associations in the United States. By 1962 AmTote had almost a total monopoly of the totalisator business in the

FPI—SS—3-17-72—20M—9153

United States. Atusa had only a very few installations in this country.

31. AmTote had a very large investment in primarily electromechanical totalisator equipment of the kind it leased for use at Aqueduct and Roosevelt Raceway. It had a long term and continuing interest in using electronic data processing means in parimutuel betting systems, but it had not either built, acquired or acquired a patent on any complete solid state electronic data processing system for parimutuel betting at racetracks before March 1962. AmTote, as late as 1962, was professedly still unconvinced that electronic data processing equipment sufficiently rugged and reliable for racetrack use was available.

32. There was not a long-felt need for electronics to handle parimutuel betting at racetracks; it was evident at all times that introduction of electronic devices ought in theory to make possible savings in time, space, cost, and, perhaps, personnel at racetracks as in other money-handling establishments, and considerable work was done in designing and, to a certain limited extent in devising data processing components and systems for parimutuel betting at racetracks; however, there was no want of practical, efficient and economically

feasible electromechanical and mixed electromechanical and electronic installations in daily use at racetracks all over this and other countries for handling parimutuel betting.

33. By the middle 1950s, an electronic totalisator could have been built that was both reliable and economic.

34. As of 1952, the dual computer-magnetic drum technology was available to build a successful electronic totalisator. By the mid-1950s, transistor circuitry was also available. By the mid-1950s the technology actually used by Digitronics in constructing the electronic totalisator for Westbury was available.

35. AmTote reportedly had an experimental installation at Roosevelt Raceway in 1947 possibly designed along the lines of the Moerman system of his patent No. 2,472,542 (Exhibit 71); the system was used for six weeks to handle the "show" pool and later was junked. A later "Mercury" totalisator installation at Roosevelt, in which about $75,000 was invested, broke down and was abandoned. Both the Moerman and Mercury efforts antedated the availability of solid state devices and technology. Other alleged efforts in the 60s, under Swedish auspices and in Canada, are not sufficiently evidenced to warrant any findings.

FPI—SS—3-17-72—30M—9153

36. Digitronics Corporation was formed in 1957 by Eugene Leonard, Albert Auerbach and Robert Shaw, all of whom had earlier electronic data processing experience; Digitronics actively sought "systems" business, and, among systems it had supplied was a medical access and analysis system for the Schering Drug Company which involved the electronic scanning of a plurality of lever operable data input stations, the collection and storage of data obtained therefrom on magnetic tape units and the return of selectively generated signals to the data input stations.

37. In early 1959, Digitronics Corporation actively sought, as an item of "systems" business to enhance its corporate income, a contract from Roosevelt Raceway to design and construct a totalisator system employing electronic data processing techniques to replace the electromechanical totalisator system then being employed to handle parimutuel betting at the track.

38. Leonard (of Digitronics) had no doubts or reservations as to Digitronics' ability to provide an electronic data processing system to perform the requisite totalisator functions for parimutuel betting.

FPI—SS—3-17-72—30M—9153

39. Exactly what was comprised in the Demonstrator or prototype is not certainly ascertainable and plaintiff is responsible for that circumstance. In the absence of the plaintiff's production of the evidence that must of necessity have been in its possession and which it has failed to produce defendants are entitled to a finding based on the remaining evidence that:

A. The "Demonstrator" or prototype electronic totalisator system included, prior to March 28, 1962:

a) 16 simulated (non-ticket dispensing) ticket issuing machines and 3 regular (ticket dispensing) ticket issuing machines,

b) electronic solid state aggregators for accumulating the amounts wagered on each entry in a race,

c) electronic solid state aggregators for accumulating the total amounts bet on all entries in a race,

d) an electronic scanner for sequentially connecting the ticket issuing machines wanting to place a bet to the aggregators,

e) an electrically operable digital indicator display board for the display of entry, odds and pay off information and the like,

f) digital solid state computing devices for calculating probable odds and pay offs,

FPI—SS—3-17-72—30M—9153

g) an electronic solid state memory for recording the bets made on each ticket issuing machine,

all electrically interconnected to provide for information transfer between components thereof and periodic updating and display of necessary information.

B. The ticket dispensing type of ticket issuing machines employed with the demonstrator electronic totalisator prior to March 28, 1962 included:

(1) a plurality of selectively actuatable and latching transaction selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon that is related to a latched switch, and

(3) a rejection signal responsive means for unlatching latched switches relating to a scratched entry.

40. None of the named inventors of the patent in suit made any conceptual contribution to any of the electronic totalisator subject matter incorporated in the "Demonstrator" electronic totalisator system. The work of the named patentee, Weida, in the three weeks preceding the first start-up of the

FPI—SS—3-17-72—30M—$153

"Demonstrator" may have embraced (i) correcting a deficiency in the probable odds computation, a matter not claimed in Claims 20-27; (ii) correcting the aggregator so that it did not go from 100 to zero but to 101, which would not involve any conceptual contribution nor is it possible to see how it could involve design change as distinguished from eliminating, within constant design, a limit on the number of binary "places"; and (iii) debugging the system. Such contributions would not constitute the patentee Weida a joint inventor within 35 U.S.C. 116, 256.

41. The Westbury "All Electronic Totalizator" brochure, was published and distributed prior to March 28, 1962; it describes and discloses an electronic solid state totalisator system which includes:

a) a plurality of ticket issuing machines,

b) an electronic solid state aggregator for accumulating the amounts wagered on each entry in the race,

c) an electronic solid state aggregator for accumulating the total amounts bet on all entries in a race,

d) an electronic scanner for sequentially connecting the ticket issuing machines wanting to place a bet to the aggregators,

FPI—SS—3-17-72—30M—0153

e) electrically operable display boards at various locations for the display of entry, odds and pay off information and the like,

f) an electronic solid state digital computer for calculating the odds, and

g) an electronic solid state digital computer for calculating pay offs,

all electrically interconnected to provide for information transfer between components thereof and periodic updating and display of necessary information.

42. The Westbury "All Electronic Totalizator" brochure, as published and distributed prior to March 28, 1962, describes and discloses an electronic solid state totalisator system which includes:

a) provision for handling of bets on scratched horses including prevention of issuance of a ticket thereon,

b) error checking of input data and internal error checking within the computer components,

c) duplication of system components and operations performed,

d) provision for handling of daily double betting, and

e) provision for elaborate permanent record print-out for accounting and record keeping purposes.

FPI—SS—3-17-72—30M—9153

43. The Demonstrator or prototype included all of the subject matter recited in Claims 20, 21 and 22 (Tr.1814-1823, 3728 et seq.); Claims 20 - 22 read on the Demonstrator-prototype;the contention that the Demonstrator-prototype did not exhibit a plurality of TIMs is unsubstantial; (i) the demonstrator indicated a plurality of TIMs as a critical component of any such system and used illustrative TIMs and TIM dummies to demonstrate the plurality element; and (ii) so far as Claims 20-22 are concerned the plurality of the TIMs is irrelevant to the substance of the claims, which deal with the combinations of elements relevant to processing transactions at any one TIM.

44. Nothing in the specification or claims of the patent limits the claimed inventions to solid state electronic data processing; in light of the explicit omission of reference to electronic means and components (except in the reference to electronic scanning (Column 10, lines 72 et seq.); contrast Weida patents Nos.2,848,532 and 3,042,902, Exhibits P and Q, prosecuted by the same attorney of record as the present patent) the claims cannot be read as solid state digital electronic data processing system claims, but must be interpreted as in-

FPI—SS—3-17-72—30M—9153

tended to and in form claiming any means embraced in the disclosure of the specification, including any electromechanical or mechanical means that were adequate to function as the indicated means and within the designation of the means language.

45. Plaintiff did not advise the Patent Office of its developmental and attempted commercial exploitation activities relating to and based on the demonstrator prototype and its successful demonstrations that preceded the filing of the application for the patent in suit including:

(a) the Leonard specification and the January 31, 1961 totalisator agreement, Exhibit AP;

(b) the existence, demonstration and nature of the "demonstrator" - prototype electronic totalisator system; the contract of January 31, 1961 affecting it; and nature and extent of Shaw's and Kielsohn's work on the demonstrator;

(c) the distribution of the Westbury "All Electronic Totalizator" brochure;

(d) the contract for the sale of the "First Totalisator";

(e) the nature of the electromechanical totalisator system and electronic adjuncts thereto as employed at the Roosevelt and Aqueduct tracks in 1961.

46. Claims 20 through 27 are invalid for want of

FPI--SS--3-17-72--30M--9153

patentable novelty in light of the prior art and the requirements of 35 U.S.C. 103.

47. None of Claims 20-27 can be found to be valid over the demonstrator-prototype in light of plaintiff's failure to make disclosure of the details of the device or adequately to explain its inability to do so.

48. The accused devices do not infringe any of Claims 20 through 27 for the reason that such claims do not extend to systems achieving the same functions as the patent's several combinations of machine means claims by using a general-purpose digital electronic data processor with programmed instructions.

49. The evidence does not support a finding that the patentees and Spiecens consciously participated in the execution of a false oath and in filing it in the Patent Office on March 28, 1963. The patentees were not, however, in fact the inventors of the whole subject matter on which patent claims were sought in light of the extent of anticipation of certain claims of the patent by the demonstrator-prototype with which not even the patentee Weida had such a connection as to constitute him a coinventor of the demonstrator-prototype. The conception of the demonstrator-prototype was not shared by Weida, and its

FPI—SS—3-17-72—30M—9153

reduction to practice in the successful demonstrator-prototype was completed without any creative contribution on Weida's part.

50. It is concluded that as a matter of law -

A. Claims 20-27 of patent No. 3,252,149 are invalid under 35 U.S.C. 102 and 103; and

B. The accused devices, the NYRA totalisator system and the PDP-8 totalisator system, do not infringe any of claims 20-27.

51. Issuance of the patent was not procured through fraud or concealment or culpable non-disclosure.

52. No violation by plaintiff of the antitrust laws has been shown.

It is, accordingly,

ORDERED that the Clerk enter judgment,

1. That plaintiff take nothing and that the action is dismissed on the merits with costs as taxed by the Clerk;

2. That claims 20-27 inclusive of U.S. Patent No. 3,252,149 are invalid and have not been infringed by defendants, and

3. That defendant Automatic Totalisators (U.S.A.) Ltd. takes nothing on its second counterclaim and that it is dismissed on the merits without costs.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

----------x

A296
DIGITRONICS CORPORATION, NOW AMPEREX ELECTRONIC CORPORATION,

Plaintiff,

-against-

THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.,

Defendants.

----------x

FILED
IN CLERK'S OFFICE
U. S. DISTRICT COURT E.D. N.Y.
SEP 22 1975
TIME A.M.
P.M.

67C 1119

A memorandum and order and findings of fact and order for judgment of the Honorable John F. Dooling, Jr., United States District Judge, having been filed on September 16, 1975, concluding as a matter of law, that claims 20-27 of patent No. 3,252,149 are invalid under 35 U.S.C. 102 and 103; and that the accused devices, the New York Racing Association totalisator system and the PDP-8 totalisator system do not infringe any of claims 20-27, and directing the Clerk to enter judgment, that plaintiff take nothing and that the action is dismissed on the merits with costs as taxed by the Clerk; and that claims 20-27 inclusive of U.S. Patent No. 3,252,149 are invalid and have not been infringed by the defendants; and that defendant Automatic Totalisators (U.S.A.) Ltd. takes nothing on its second counterclaim and that it is dismissed on the merits without costs, it is

ORDERED and ADJUDGED that the plaintiff take nothing and that the action is dismissed on the merits with costs as taxed by the Clerk; and it is further

ORDERED and ADJUDGED that claims 20-27 inclusive of U.S. Patent No. 3,252,149 are invalid and have not been infringed by the defendants, and it is further

Brooklyn, New York

September 16, 1975.

U. S. D. J.

BEST COPY AVAILABLE

ORDERED and ADJUDGED that the second counterclaim of defendant Automatic Totalisators (U.S.A.) Ltd. is dismissed on the merits without costs and that the defendant Automatic Totalisators (U.S.A.)Ltd. take nothing on that counterclaim.

Dated: Brooklyn, New York
September 19, 1975

Louis Orgel
Clerk

Approved:

U.S.D.J.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

- -X

DIGITRONICS CORPORATION, NOW AMPEREX ELECTRONIC CORPORATION,

Plaintiff,

-against-

THE NEW YORK RACING ASSOCIATION, INC., AUTOMATIC TOTALISATORS (U.S.A.) LTD., AUTOMATIC TOTALISATORS LTD. and PREMIER EQUIPMENT PROPRIETARY LTD.,

Defendants.

- -X

67 C 1119
MEMORANDUM
and
ORDER

The motions of both parties are in all respects denied.

(1) Plaintiff's motion to amend the findings under Rule 52(b) would amount to accepting plaintiff's view of aspects of the evidence in the teeth of the total effect of the trial evidence. The data and arguments now brought forward explain nothing, and could not reasonably be expected to support the suggested altered findings. The theoretical points made rehash what has been carefully decided. If the decision is wrong, repetition of argument rejected in this Court is better addressed to an appellate tribunal.

The affidavits submitted in support of the application answer themselves; the effort they reflect would have been

FPI—SS—3-17-72—30M—9153

better employed if addressed thirteen years ago to advising Spiecens adequately, or over eight years ago in deciding whether to sue, or, after suit, to make meaningful to both sides the first stages of discovery, in early 1968, or during the five weeks of trial in 1974-1975, to resolve manifest issues of anticipation; today they serve no purpose except to underline the consequences of early neglect.

(2) Defendants' motion to amend the judgment to declare (a) Claims 20-27 invalid because they were not the invention of the patentees, (b) to invalidate the patent under the sale clause (Section 102(b)), and (c) to award attorneys fees on the ground that the case is exceptional is denied.

(a) The judgment, findings and memorandum, taken together, express all the determinations considered appropriate. The point is that none of the patentees contributed to the Demonstrater or prototype. The article of the patent could not be found, on the evidence, to have been patentable over the Demonstrater, and, on the evidence, the Demonstrater was critical prior art. But that does not signify that what Weida et al. filed on did not have to be processed as the Weida et al. invention against all the relevant prior art, and found good or bad in the light of it. See Memorandum

and Order pp. 63 et seq.

(b) Timely Products Corp. v. Arron, 2d Cir. 1975, 523 F.2d 288, does not, as appears from Judge Conner's very precise delineation of the requisites of the "on-sale" finding (523 F.2d at 302), authorize any change in the conclusion reached in the Memorandum and Order, pp. 65-67.

(c) Nor do Timely, supra, and Kramer v. Duralite Company, Inc., 2d Cir. 1975, 514 F.2d 1076, support the conclusion that an award of attorneys fees is warranted in this case. Kramer involved what the Court found to be an utterly false claim that the patentee had chosen the angles that were critical to the inventive novelty of the hinge bracket of the patent. Timely too, was a case of a patentee's calculated concealment of a matter germane to the successful prosecution of the Arron patent. 523 F.2d at 297-298, 305. The findings underlying the conclusion reached in the present case make plain the reasons why neither Kramer nor Timely is applicable here. See Memorandum and Order pp. 213-216.

It is so ORDERED.

Brooklyn, New York
January 13, 1976.

U. S. D. J.

FPI—SS—3-17-72—30M—9153

May 17, 1966 R. L. WEIDA ETAL 3,252,149

DATA PROCESSING SYSTEM

Filed March 28, 1963 5 Sheets-Sheet 1

FIG. 1A

INVENTORS
Robert L. Weida
Edward M. Richards
Evelyn Berezin
Jack Kroll
Philip Rosenblatt
BY S. C. Yoder
ATTORNEYS

A301

May 17, 1966 R. L. WEIDA ETAL 3,252,149

DATA PROCESSING SYSTEM

Filed March 28, 1963 5 Sheets-Sheet 2

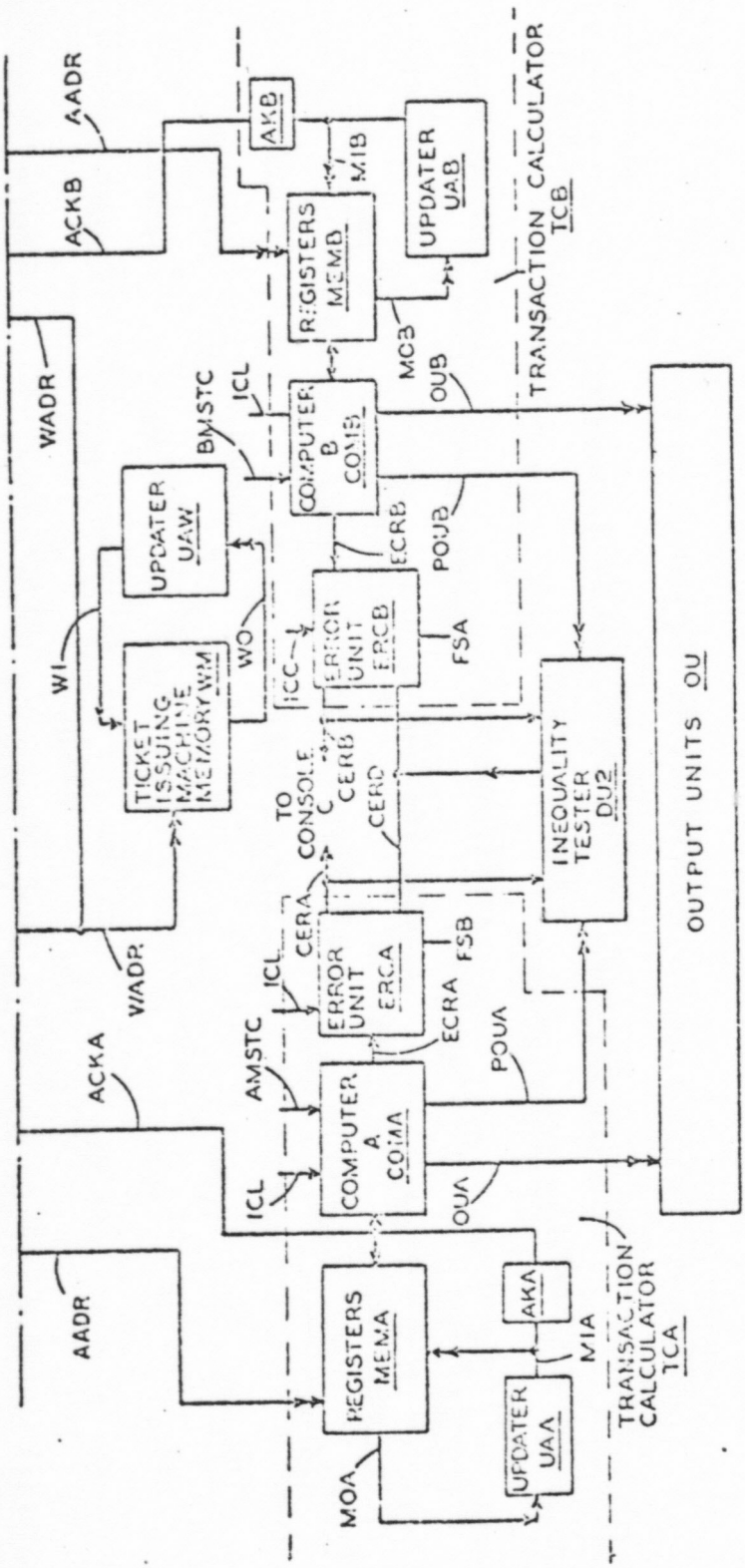


FIG. 1B

PARIMUTUAL SYSTEM

May 17, 1966 R. L. WEIDA ETAL 3,252,149
Filed March 28, 1963 DATA PROCESSING SYSTEM 5 Sheets-Sheet 3

FIG. 2

TRANSACTION PROCESSOR MRA

A304

May 17, 1966 R. L. WEIDA ETAL 3,252,149

DATA PROCESSING SYSTEM

Filed March 28, 1963 5 Sheets-Sheet 4

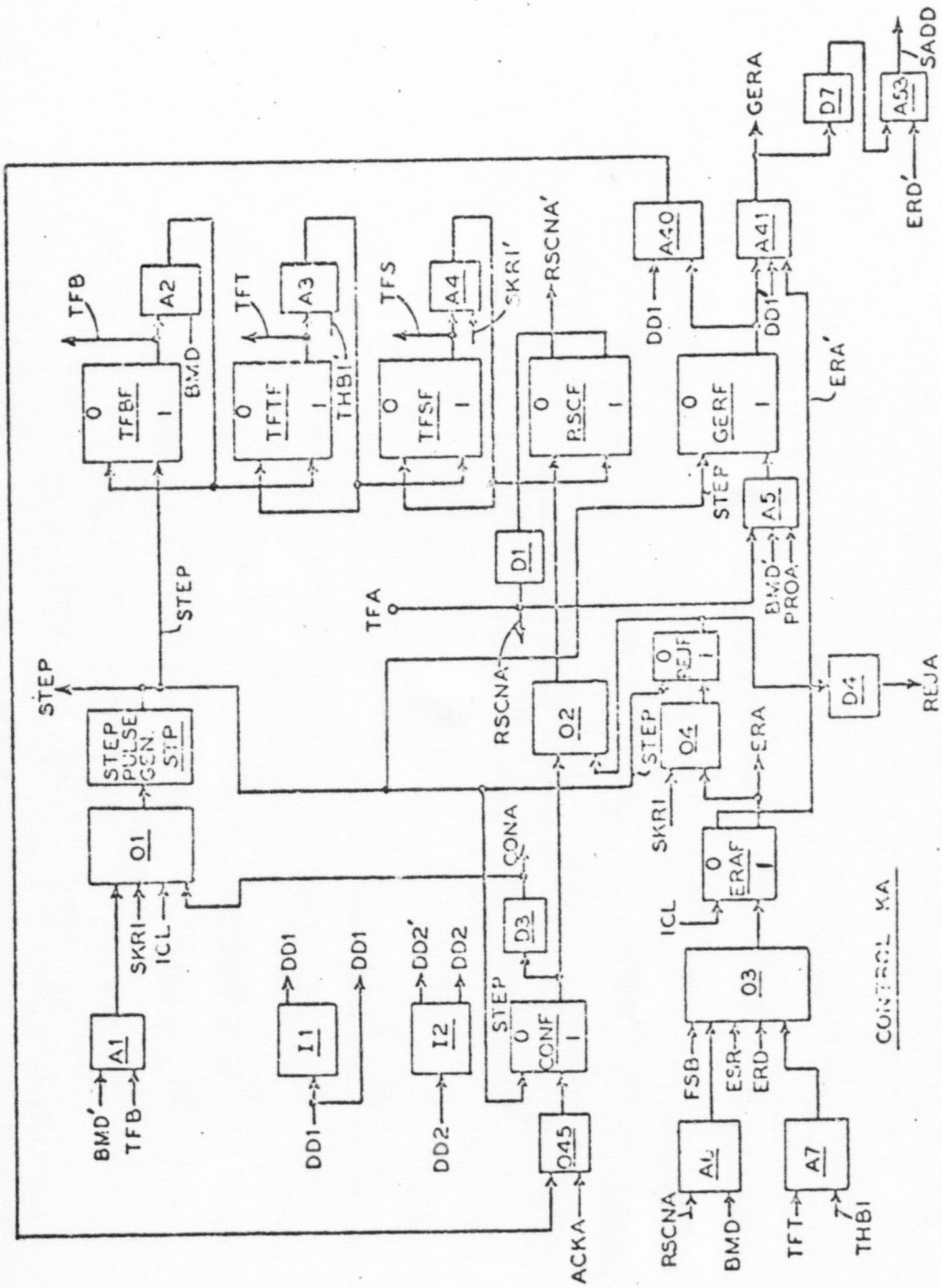


FIG. 3

May 17, 1966 R. L. WEIDA ETAL 3,252,149

DATA PROCESSING SYSTEM

Filed March 28, 1963 5 Sheets-Sheet 5

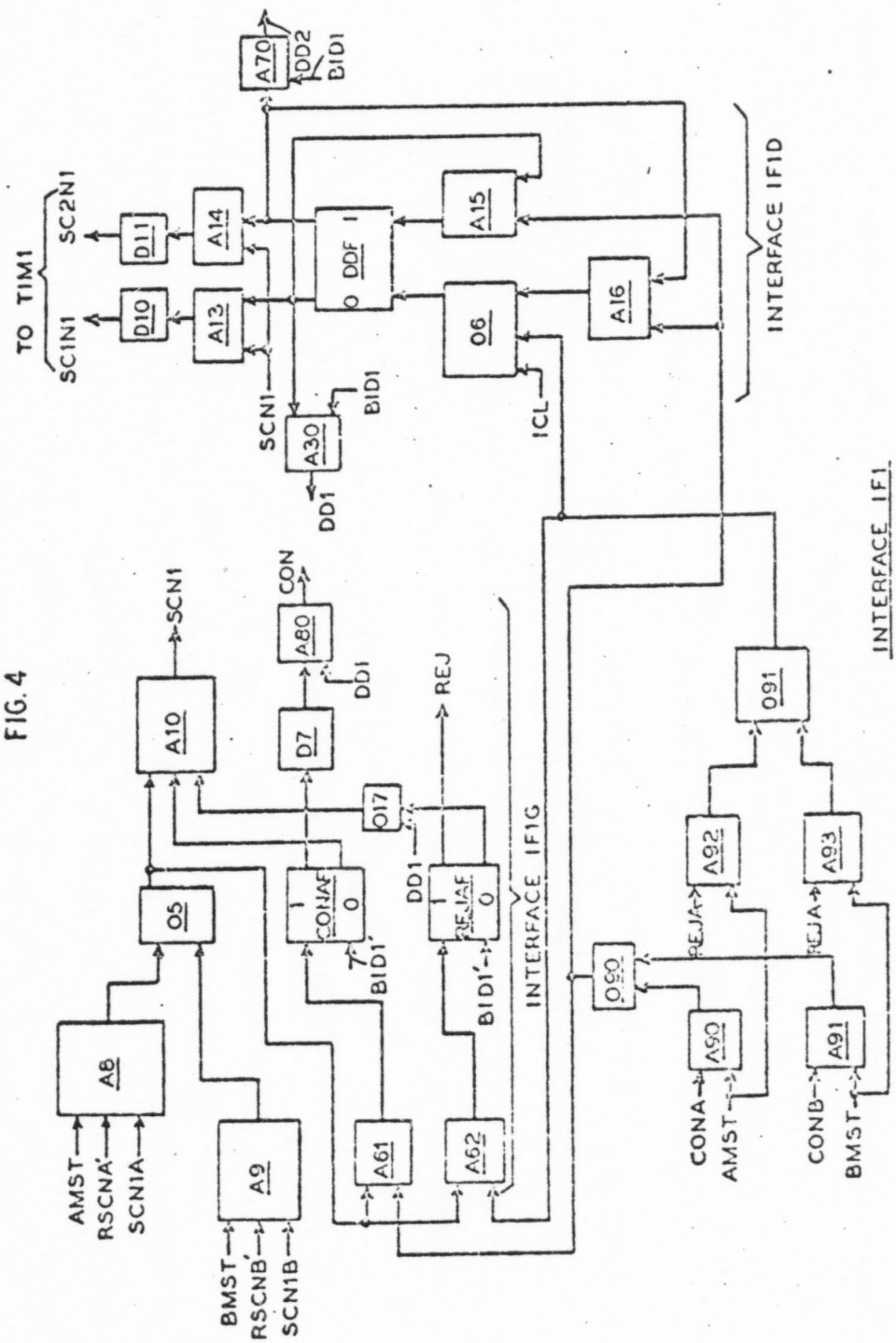


FIG. 4

A306

United States Patent Office

3,252,149

Patented May 17, 1966

3,252,149

DATA PROCESSING SYSTEM

Robert L. Weida, Whitestone, Edward M. Richards, East Northport, Evelyn Berezin, New York, Jack Knoll, Plainview, and Philip Rosenblatt, Mount Vernon, N.Y., assignors to Digitronics Corporation, Albertson, N.Y., a corporation of Delaware

Filed Mar. 28, 1963, Ser. No. 268,743

33 Claims. (Cl. 340—172.5)

This invention pertains to data processing systems and more particularly to systems for processing data received from ticket issuing machines.

One of the most common of these systems is a parimutuel system employed for servicing transactions or wagers made by spectators at sporting events. Presently available systems are slow operating, have only average reliability, depend on considerable human assistance and have limited versatility. It should be particularly noted that such systems can neither tolerate any down time during the course of wagering by the spectators, nor can it tolerate any errors in the processing of the wagers.

It is a general object of one aspect of the invention related to the problem of down time and reliability to provide an improved parimutuel system.

Briefly in accordance with this aspect of the invention a data processor is provided for processing transactions having a plurality of pairs units. Each of the units of the pair concurrently performs the same functions. However, one unit is the master unit and the other the slave unit. A master selecting means initially selects which unit of a pair of units is the master unit and which is the slave unit. The master selecting means can instantaneously change the slave unit of a pair of units to the master unit of that pair of units whenever it receives an erroneous-transaction indicating signal from the master unit of that pair. Checking means are included in each unit of the pairs for checking for erroneous transaction signals so as to transmit an erroneous-transaction indicating signal to the master selecting means.

Features of this aspect of the invention include: various checking means for detecting erroneous transaction signals; means for deactivating the data processor when the checking means in both units of a pair detect erroneous-transaction signals; means for comparing the results obtained by each unit of a pair for equality so as to deactivate the data processor if an inequality exists; means for synchronizing the units of a pair of units to each other; and means for rendering ineffective the unit of a pair of units which detected erroneous-transaction signals.

It is a general object of another aspect of the invention to provide a more versatile system. Briefly, in view of this a plurality of relatively slow operating ticket issuing machines for transactions.

Briefly, in accordance with this aspect of the invention, scanning means are provided for sequentially and periodically selecting each of the ticket issuing machines for interrogation. Interrogating means transmit an interrogation signal to the selected ticket issuing machine. If the selected ticket issuing machine is prepared to make a transaction it will transmit a selected transaction signal. Means sense for the transmission of the selected transaction signal which if not sensed causes the scanning means to immediately step to another ticket issuing machine for interrogation.

A feature of this aspect of the invention is to insure that succeeding attempted interrogations by the scanning means of a ticket issuing machine which has had its transaction confirmed or rejected do not cause the transmission of redundant selected transaction signals.

It is a general object of another aspect of the invention to provide a more versatile system. Briefly, in view of this aspect of the invention, apparatus is provided for processing sequential multientry transactions such as, but not limited to, daily doubles. The apparatus includes means for insuring that the first entry is first received and only transferred to a storage means and that the second entry is then received. Address generating means only then accept the first entry stored in the storage means and the second received entry to generate a storage address which is used to select a storage register associated with the particular first and second entries.

Other objects, features and advantages of the invention will be apparent from the following detailed description of the invention when read with the accompanying figures wherein:

FIGS 1A and 1B show a parimutuel system as an exemplary embodiment of the invention;

FIG. 2 shows the transaction processor MRA of the system of FIG. 1;

FIG. 3 shows in logical symbols the control KA of the message register MRA of FIG. 2; and

FIG. 4 shows the interface IF1 of the parimutuel system of FIG. 1.

The system includes a plurality of ticket issuing machines which accept transactions on entries in a contest such as a horse race. At least one of the ticket issuing machines will handle what is commonly known as a daily double transaction. The transactions are operated upon by a data processor. The data processor includes common units such as a console C, first and second inequality testers DU1 and DU2, and output units OU. The data processor further includes pairs of units such as scanners SCA and SCB, buffers 1A to NA, and 1B to NB, transaction processors MRA and MRB, and transaction calculators TCA and TCB. Generally, the system is set up so that one unit of each pair will operate as a master and the other as a slave. This is called the dual mode. However, it is possible to initially set up the system so that just one unit of each pair operates and the other is idle. This is called the simplex mode.

Each transaction calculator TCA and TCB includes a plurality of registers a portion of which are aggregator registers; aggregated transaction updating means, a computer, an error unit and an acknowledge unit.

The system will be described operating in the dual mode with the A side as the master. It should be noted that the left hand units of the pairs in FIGURE 1 have a reference character terminating with the letter A and these units comprise the A side. Similarly, the right hand side is the B side.

A switch in the console C will generate the AMST and AMSTC signals fed respectively to the transaction processor MRA and the transaction calculator TCA, indicating they are the masters. In addition the AMST signal is fed to all of the interfaces IF1 to IFN so that scanner SCA will control the sequential and periodic interrogation of the ticket issuing machines TIM1 to TIMN. In spite of this fact, scanner SCB will follow along to instantaneously take over in case of emergency as is hereafter more fully described. In any event, each transaction processor MRA and MRB will concurrently process a transaction; i.e. check for erroneous transactions and and other internally generated errors, and generate storage addresses for the memory positions in the ticket issuing machine memory whose contents are to be updated and also the addresses of the aggregator registers in the transaction calculators TCA and TCB whose contents (the aggregated transactions) are to be updated. While both transaction processors MRA and MRB both process the transactions, only the processed transaction information from the master transaction processor is fed to both transaction calculators TCA and TCB. Both the transaction calculators TCA and TCB operate on the processed

BEST COPY AVAILABLE

transaction information to calculate odds, pools, payoffs and similar information. However, because transaction calculator TCA is the master by virtue of the AMSTC signal from console C, only its result information is fed to the various output units OU.

Transaction calculator TCB follows along to immediately take over if there is a failure in transaction calculator TCA. Of course it is understood that side B could equally be the master. Furthermore, there can be a split; i.e. scanner SCA and transaction processor MRA, and transaction calculator TCB being the masters whereas scanner SCB and transaction processor MRB, and transaction calculator TCA being the slaves or vice versa. What should be understood, however, is that while one of the units of a pair controls the flow of information, the other unit of a pair operates both as an on-line standby unit to immediately, either partially or entirely, be switched into the circuit if failures occur in the master unit of the pair and also to perform a check on the master unit of the pair.

All units are connected by signal lines which transfer signals between the units. It should be noted that the signal lines bear the same reference characters as the signals on the lines and that this terminology is used interchangeably. Accordingly, when only the signal has been mentioned, the signal line is implied and vice versa. Furthermore, some signals are shown in a single line for the sake of convenience in spite of the fact that they are a plurality of lines in a cable. The lines AADR, WADR, MOA, MIA, SKNA and SKRN are typical examples. In addition the lines shown only indicate one polarity of [this] signal such as the BID1[1] signal. However, concurrent with this signal line there are instances where there is a parallel signal line carrying the opposite polarity of this such as the BID1' signal.

Switches on the console C determine which side is master, say the A side, by positioning the SMST switch to the A position which generates the AMST and AMSTC signals, initially clear the system (the ICL signal) by momentarily depressing the initial clear switch SIC, and indicate the entries upon which no transactions will be allowed by positioning the appropriate non-transaction switches SKWN which respectively generate the associated non-transaction signals SKRN. These would be "scratches" in a horse race.

The AMST signal fed to the interfaces IF1 . . . IFN (only two of which are shown, although there are many) sensitizes these units to interrogating signals such as the SCN1A signal from the scanner SCA and not the scanner SCB although both are simultaneously present at an interface. The AMST signal fed to transaction processors MRA and MRB insures that storage address signals are fed only from the transaction processor MRA to registers MEMA and MEMB and ticket issuing machine memory WM. Similarly the AMSTC signal fed to the transaction calculator TCA insures that only its result information is fed to the output units OU.

The ICL signal fed at least to the transaction processors MRA and MRB presets the scan counters SKA and SKB (a typical one being shown in FIGURE 3) to their initial count of one. The outputs of the scan counters SKA and SKB are fed as the SKNA and SKNB signals respectively from transaction processors MRA and MRB to scanners SCA and SCB. The SKNA and SKNB signals are decoded by the scanners SCA and SCB and become respectively the SCN1A and SCN1B signals which only go to interface IF1. If the ticket issuing machine TIM1, which is the daily double machine, wishes to make a transaction then one of its transaction keys from each bank will be depressed and BID1 signals will be received by the interface IF1 which has no effect at this time. A DD1 signal indicating that this is the first entry of a daily double transaction is fed to the transaction processors MRA and MRB. The scan is now at ticket issuing machine TIM1 for interrogation of the first entry of the daily double transaction. The SCN1A signal passes to the ticket issuing machine TIM1 as an SCIN1 signal which is fed to the common side of all of the transaction-selection switches of the first bank in ticket issuing machine TIM1 (see FIG. 4). This signal will pass through to the other side of the closed transaction selection switch of the first bank and is fed out as a selected transaction HN1 signal to buffers NA and NB (N is actually the number of the entry or the number of the depressed entry key). For example, if the first entry of the daily double transaction is being inserted on entry 1, the entry key 1 of the first bank would have been depressed, causing the closing and latching of the associated transaction-selection switch and an H11 signal would be fed through buffers 1A and 1B to become respectively the particular entry H1A and H1B signals fed to both the transaction processors MRA and MRB respectively. The H1A signal is stored in the entry register 1HRA and also and more particularly in the entry register 2HRA (FIG. 2) under the control of the DD1 signal. The H1B signal is stored in an identical entry register 2HRB (not shown) of transaction processor MRB.

It should be noted that unless specifically indicated otherwise, whatever applies to the transaction processor MRA also applies to the transaction processor MRB, since both of these units are identical and perform concurrent processing steps.

At the same time, control KA (FIG. 2) transmits a test for transaction made TFB signal generated by flip-flop TFBF (FIG. 3) to probe the transaction made unit BMA. If a transaction has been made as indicated by the presence of a signal on one of the HNA lines, a BMD signal is fed back to control KA to start an error test routine. If no BMD signal is fed back, control KA generates a STEP signal to scan counter SKA which steps to the count of 2 to initiate the transaction interrogation of ticket issuing machine TIM2. The detailed operations associated with the STEP signal will be described hereinafter. It should be noted that the HNA signal was derived from the SCIN1 signal passing through a latched transaction switch and if this switch was not latched the STEP signal was generated. Therefore, this is the method for stepping over ticket issuing machines which are not prepared to perform a transaction.

However, assume, as we have, that one of the transaction selection switches was latched. Therefore one of the HNA signals is present, causing the transmission of a BMD signal to control KA. Therefore, the error test routine starts. In particular, the presence of the BMD signal at an input of and unit A2 passes a pulse to the set to "1" input terminal of flip flop TFTF which generates the TFT signal and to the set to "0" terminal of flip flop TFBF (FIG. 3). The first test of the error test routine after the test for bet made process step is a two entry transaction test, i.e. a test is made to insure that the signals from entry register 1HRA indicate only one entry is stored therein. It could conceivably happen that ticket issuing machine TIM1 faultily transmitted both the H11 and H21 signals at the same time or that through a failure in the buffers 1A and 2A both the H1A and H2A signals are transmitted to the entry register 1HRA. In such a case, the two entry transaction test unit THBA (FIG. 2) will reply with a THBI signal in response to the TFT signal from control unit KA. If such is the case, control KA sets the error flip-flop ERAF generating the ERA signal (FIG. 3) and generates the REJA signal. The detailed operations of the ERA and REJA signals are hereinafter more fully described. For the time being it is only necessary to know that the REJA signal results in the unlatching of the latched transaction selection key in the ticket issuing machine TIM1 and that the ERA signal will render the message register MRA ineffective. The ERA signal is fed to the transaction processor MRB, inequality tester DU1

and the console C to perform functions which are hereinafter more fully described.

If no such error is detected a THBI' signal is fed to one input of and unit A3 whose output is fed to the set to "0" input of flip-flop TFTF and to the set to "1" input of flip-flop TFSF which generates the TFS signal to test for the selection of an entry upon which no transaction will be accepted is now made. This is in racing parlance a scratch test. The signal representing the entry stored in the entry register 1HRA (FIG. 2) is fed as one of the 1HRN signals to the test for non-allowed transaction unit TFSA and are compared with the non-transaction signals SKRN from console C. The TFS signal from control KA probes for equality which if it exists causes the return of a SKRI signal to control KA which generates a REJA signal. It also causes the generation of an STEP signal fed to scan counter SKA for stepping the scan to the ticket issuing machine TIM2. If no non-allowed transaction is detected the next error processing step is performed. In particular, a SKRI' signal is fed to one input of and unit A4 whose output is fed to the set to "0" input of flip-flop TFSF and the set to "1" input of flip-flop RSCF which generates the RSCNA' signal. This starts the false entry test which ensures that the signal on one of the lines HNA truly resulted from the depressing of an entry key. The signal RSCNA' is fed from transaction processor MRA to all the interfaces. However, since the scan is at ticket issuing machine TIM1 (the SCN1A signal), it passes through interface IF1 where it terminates the generation of the SC1N1 signal (see FIG. 4). It will be recalled that the SC1N1 signal was the interrogating signal which passed through the latched transaction selection switch causing transmission of signals through buffers 1A to NA and 1B to NB to indicate which entry a transaction was being made upon. Therefore none of the lines HNA should carry a signal when the SC1N1 signal is absent. After a delay to permit the passage of signals through the loop including the ticket issuing machine TIM1, the RSCNA signal is fed to the transaction made unit BMA (FIG. 2). At this time if no signals are on the lines HNA a BMD signal is not generated. If however the BMD signal, indicating one of the HNA signals must be present, is generated, control KA will receive this signal which causes the setting of the error flip-flop ERAF and the generation of the ERA and REJA signals in the usual manner.

During this test a synchronizing operation is performed. It will be recalled that in the case under discussion, the A side is the master but the B side follows along. Therefore, it is necessary to keep the scanners SCA and SCB in step so that if the A side (master) drops out the B side picks up exactly where the A side left off. Therefore, since there may be some differences in the time to perform the error processing by each of the transaction processors MRA and MRB because there is no overall master synchronization, these processors are synchronized to each other. It should be noted that an overall master synchronization would defeat the independency of the sides. Therefore, when either transaction processor completes a test routine it generates a signal indicating this fact. For example, after tests are made for test for bet made, the test for two-entry transaction, and the test for non-allowed transactions and concurrent with the test for a false entry transaction, the test-finished TFA signal is generated by control KA (FIG. 3) and is fed to the synchronizer SYNA (FIG. 2). The TFA signal is also transmitted to the analogous synchronizer SYNB in the transaction processor MRB. When the transaction processor MRB reaches this same point, it transmits the TFB signal to the synchronizer SYNA. At this time, the coincidence of the TFA and TFB signals cause the generation of a PROA signal which is fed to the control KA to initiate the next processing step. Although for the sake of simplicity this synchronization is shown as taking place at only one processing step, it preferably occurs at each of the processing steps. In this manner the scanners SCA and SCB stay in step. However, if an error occurs in a transaction processor, it will be rendered ineffective. Therefore it will not generate succeeding test or step-finished signals, but since it generates an error signal this signal is used to replace the test-finished signal. For example, assume transaction processor MRB detected an error. It would "shut down" and start generating the ERB signal. The ERB signal is received at synchronizer SYNA and replaces the TFB signal. Therefore, a PROA signal will be generated whenever a TFA signal is generated. After all these error tests have been completed, a GERF flip-flop is set (FIG. 3). In particular, the coincidence of the PROA signal, the BMD' signal (indicating that there has been no false entry) and the RSCNA signal (the delayed "1" output of the RSCF flip-flop) at inputs to and unit A5 set the GERF flip-flop to "1." The "1" output of the GERF flip-flop is passed via and unit A40 because of the presence of the DD1 signal and is fed by the or unit O45 to the set to "1" input of the CONF flip-flop. The "1" output of the CONF flip-flop passes through or unit O2 to the set to "0" input of the RSCF flip-flop which again generates the RSCNA' signal which is fed to the interface IF1 to regenerate the SCN1 signal (see FIG. 4). Although the SCN1 signal passes through and unit A13 to again cause the generation of the SC1N1 signal which causes an entry to be accepted by entry register 1HRA as described before, it should be noted that this is the same entry as before, so it makes no difference. The "1" output of the CONF flip-flop passes through delay unit D3 to become the CONA signal which is also fed to interface IF1. The CONA signal passes through and unit A90 to an input of or unit O90. The output of or unit O90 is fed via and unit A15 (FIG. 4) to the set to "1" input of the daily double flip-flop DDF. The "1" output is gated by the BID1 signal at and unit A70 causing the generation of the DD2 signal and the "1" output gates the SCN1 signal through the and unit A14 to the delay unit D11. Delay unit D11 delays the generation of the SC2N1 signal which is used to probe the second bank of transaction selection switches. However, because of the delay, the sampling has no effect because the DD1 signal is no longer present when the SC2N1 signal is generated. The absence of the DD1 signal at and units A20 and A21 in FIG. 2 prevents the passage of the second entry into the entry register 2HRA.

The CONA signal is also fed via and unit A90, or unit O90 and and unit A61 to the set to "1" input of the CONAF flip-flop. Since the "1" output of the CONAF flip-flop is delayed by delay unit D7, the DD1 signal disappears before this "1" output reaches and unit A80, therefore no CON signal is generated at this time.

The CONA signal passes through or unit O1 (FIG. 3) to trigger the step pulse generator STP which is a conventional delay multivibrator to generate the STEP signal which accordingly occurs after the CONA signal. Therefore the scan counter SKA steps to a count of 2 so that the ticket issuing machine TIM2 may be interrogated. When the scan steps off ticket issuing machine TIM1 the BID1 signal terminates, causing the generation of the BID1' signal which is connected to the set to "0" inputs of the CONAF and REJF flip-flops (FIG. 4). REJAF

The step signal STEP clears the entry register 1HRA (FIG. 2) as well as setting the TFBF flip-flop to its "1" state, and the CONF flip-flop, the REJF flip-flop and the GERF flip-flop to their "0" states.

It should be noted that at this point only the first entry of the daily double transaction has been processed. When the scan again returns to the ticket issuing machine TIM1 the second entry of the daily double transaction is processed. When the SCN1 signal is generated as previously described, it passes through and unit A14 to cause the generation of the SC2N1 signal (FIG. 4) which probes the second bank of entry keys causing the second entry to enter the entry register 1HRA in the usual manner. It

should be noted that this entry does not pass to the entry register 2HRA (FIG. 2) because of the absence of the DD1 signals at the and units A20 and A21. The same series of processing steps are performed by the process step flip-flops as before until the GERF flip-flop is set to its "1" state. This time the presence of the DD1' signal at and unit A41 causes the "1" output of this flip-flop to become the GERA signal. Note that the "1" output does not pass through the and unit A40 because the DD1 signal is absent.

The GERA signal strobes the storage address generator SAGA (FIG. 2). The storage address generator SAGA is a plurality of and units each having one of its inputs connected to the GERA signal line and other inputs connected to various combinations of the 1HR1 . . . 1HRN, 2HR10 . . . 2HRN0, and DKN signal lines from decoder DEC.

The storage address register SAGA in response to the GERA signal transmits two groups of signals. The first group AADRA1 . . . AADRAM is associated with entry transactions; the second group AADRAM+1 to AADRAN are associated with the ticket issuing machines. These signals are grouped into a cable generalized as an AADRA signal. The AADRA signals are fed to the inequality tester DU1.

It will be recalled that the transaction processor MRB is simultaneously performing the same processing. The AADRA and AADRB signals are checked for inequality by inequality tester DU1 (FIG. 1). If they do not agree then inequality tester DU1 transmits an ERD signal to both transaction processors MRA and MRB. When the controls KA and KB thereof respectively receive this signal they cause the ineffectuation of the transaction processors MRA and MRB respectively and cause the generation of the ERA and ERB signals respectively which are fed to console C, their coincidence being an ambiguity signal which causes the deactivation of the system and gives an alarm.

If, however, these generated storage addresses represented by the AADRA and AADRB signals agree, the ERD signal is not generated and control KA generates the send address signals SADD. In particular the ERD' signal gates the GERA signal delayed by delay unit D7 through and unit A53 (FIG. 3). In FIG. 2 the SADD signal is received by the aggregator address transmitter AATA and ticket issuing machine transmitter WATA. If transaction processor MRA is the master transaction processor as indicated by the AMST signal present at an input to aggregator address transmitter AATA the first and second groups of the storage address signals AADRA pass therethrough to become the aggregator AADR signals. Likewise, the second group of AADRA signals pass through the ticket issuing machine transmitter WATA to becomes the memory position address WADR signals. Similarly, if the B side is the master (the presence of the BMST signals) then the second group of the AADRB signals becomes the WADR signal, and the first and second groups of the AADRB signals become the AADR signals.

From this point onward the operation is no different for a single entry transaction or for a daily double transaction. Therefore, the single entry transaction processing will be described up to this point.

The non-daily double transaction processing, i.e., single entry transaction, is effectively the same as the second entry of a daily double transaction and only the differences will be described. There are no DD1 and DD2 signals generated in the interface IFN of a non-daily double ticket issuing machine TIMN. Therefore, the single entry transaction only enters the entry register 1HRA. Note the DD1 signal is not present at and units A20 and A21 (FIG. 2).

Since the DD2' signal is present and the DD2 signal is not present at inputs of storage address generator SAGA only the 1HR1 to 1HRN signals, and the DKN signals will be included in the AADRA signals.

In the dual mode with both transaction calculators TCA and TCB operating the AADR signal is fed to both registers MEMA and MEMB. The addressing circuitry therein receives the aggregator address signals AADR to select the indicated aggregator register. The contents of the selected aggregator address are read out, recirculated and written back into the same selected aggregator register to update the number of transactions. In particular, for example, the AADR signals when received by the aggregator registers of registers MEMA selects the column associated with the ticket issuing machine and the row associated with the particular entry upon which a transaction is being made. The signals representing the accumulated number of transactions in that aggregator register are read out via MOA signal lines to the updater UAA where the count they represent is updated by 1 and then fed back via the MIA lines to the original aggregator register in registers MEMA. At this time, registers MEMA feed an acknowledgment ACKA signal via amplifier AKA, indicating the transaction has been recorded, to the control KA.

The ACKA signal, whether as a result of a daily double transaction or a single entry transaction, passes through, or unit C45 (FIG. 3) to set the CONF flip-flop to the "1" state and the resulting procedure described for such a condition during the entry of the first entry of the daily double transaction procedure occurs with minor differences. Since the DD1 signal is not present at and unit A80 (FIG. 4) the "1" output of the CONAF passes therethrough to become the CON signal which is fed to the ticket issuing machine under scan causing the unlatching of the switches and the issuing of the ticket receipt. If the daily double ticket issuing machine TIM1 is under scan then the CONA signal also passes via and unit A46 and or unit C5 to the set to "0" input terminal of daily double flip-flop DDF so that it is prepared to receive the first entry of a new daily double transaction at a later time. It should be noted that non-daily double interfaces only include the interface IFIG portion of FIG. 4. Furthermore, the CON signal is taken directly from the "1" output of the CONF flip-flop. Therefore and unit A80 and delay unit D7 may be deleted.

Of course, all this time, transaction calculator TCB and registers MEMB are performing the same operations resulting in the generation of an ACKB signal fed to transaction processor MRB. However, it should be noted that since the A side is the master the AMAST signal is present at interface IF1 and therefore the CONA signal from transaction processor MRA does the confirming, in spite of the fact that the CONB signal from transaction processor MRB is also fed to the interfaces.

While the entry transaction is being aggregated the specific ticket issuing machine transaction is also aggregated. In particular, the WADR signal is fed to ticket issuing machine memory WM. The specific addressed memory position therein is selected in a manner described above for the registers MEMA and the contents of that addressed memory position are read out on the WO signal lines and fed via the updater UAW and the WI signal lines back to the same addressed memory position in the ticket issuing machine memory WM. In this way, a central check is maintained on the number of transactions made by each ticket issuer. For the sake of simplicity there has been shown only an aggregation of the total transactions made by a ticket issuer. The routine can obviously be refined to also indicate the specific activity on each entry.

The transaction processors MRA and MRB continue in this maner to sequentially interrogate each ticket issuing machine TIMN and process any transactions that are made. Finally, the scan counters SKA and SKB reach a count that is one greater than the number of ticket issuing machines TIMN. Therefore, no ticket issuing machine is interrogated on this step. Instead, the reliability of the buffers NA and NB are tested for short circuit conditions which would effectively prevent transactions on certain

entries during certain periods of time. For example, if an element in buffer 1A associated with the line H11 is short circuited and the entry number 1 key of ticket issuing machine TIM1 is depressed while the scanner SCA is pointing to any other ticket issuing machine such as TIMN then this other ticket issuing machine will not be able to have a transaction processed on entry 1.

The test is performed by transmitting the CHKA signal derived from the SCNZA signal generated by scanner SCA to each of the buffers NA. For simplicity,

$$CHKA=SCNZA$$

Buffers NA should each transmit a simulated transaction on each entry, i.e. signals should be present in all lines H1A . . . HNA. The lines H1A . . . HNA are all fed to the end scan test ESTA (FIG. 2) and a multicoincidence is tested for by the SCNZA signal. If the multicoincidence is not obtained an ESR signal is fed to control KA causing the generation of the ERA error signal (FIG. 3).

During all the time up to the start of the race the computers COMA and COMB periodically perform calculations on the aggregated transactions to establish interim accounting results such as odds. In particular, each computer has access to the aggregator registers which supply the operands. Error checking, such parity checks, for example, are performed during these calculations. If an error is detected by either transaction calculator it generates an error signal. For example, if transaction calculator TCA detects an error it will become ineffective and cause error unit ERCA to generate a CERA signal. Similarly, for transaction calculator TCB. If transaction calculator TCA is the master as indicated by presence of the AMSTC signal from console C and transaction calculator TCB detects an error, it becomes ineffective but there is no change of master and slave. It should be noted though that the CERB signal is generated. If, however, transaction calculator TCA detects the error, the CERA signal when received by console C terminates the AMSTC signal and generates the BMSTC signal making computer B the master. The CERA and CERB signals are also fed to inequality tester DU2. The presence of either of these signals disables inequality tester DU2.

In any event, if there is no calculator error when an output is desired each transaction calculator TCA and TCB transmits the result information via the lines POUA and POUB to the inequality tester DU2 where an inequality check is performed. If an inequality in the result information is found, inequality tester DU2 generates the CERD signal which is fed to both errors units ERCA and ERCB which generate the CERA and CERB signals respectively. The coincidence of the CERA and CERB signals is an ambiguity signal to console C which deactivates the system. If equality is found, then the master transaction calculator, in the case under discussion, transaction calculator TCA, transmits the output information to the output units OU.

The effect of the setting to "1" of the error flip-flop ERAF will now be discussed. The error flip-flop ERAF will be set to "1" if: there is a false entry error indicated by coincidence of the RSCNA and BMD signals at inputs of and unit A6; there is a two entry error indicated by the coincidence of the TFT and TFBI signals at inputs of and unit A7; a short circuit in one of the buffers NA as indicated by the ESR signal from end scan test unit ESTA; an inequality error indication (the ERD signal) from inequality tester DU1; or when an FSB signal is received from console C indicating simplex mode with only the B side operative. The outputs of and units A6 and A7 and the FSB, ESR and ERD signals feed inputs of or unit O3 whose output is connected to the set to "1" input of error flip-flop ERAF. The setting of the error flip-flop ERAF at any time causes the transaction processor MRA to be ineffective, i.e. "drop out." The ERA signal is sent to console C, which, if an ERB signal is not received from transaction processor MRB, will terminate the generation of the AMST signal only if the A side is the master and start the generation of the BMST signal. (If the B side is the master, as indicated by the generation of the BMST signal, the BMST is still generated.) In such a case, i.e. the A side is master, at least a portion of the B side, that is, the scanner SCB and the transaction processor MRB will become the master and carry on, and the scanner SCA and transaction processor MRA will perform no effective function in the operation. If any time thereafter the ERB signal is received by console C the system is deactivated. In other words, even if the inequality tester DU1 does not detect an inequality it is possible for the system to shut down. This can occur when the master detected an error and the slave took over, and then the slave detected an error; or when the slave first detected an error and then the master detected an error. This is known as a joint error. The ERA signal is fed also to the transaction processor MRB and to the inequality tester DU1. Generally, the ERA signal fed to the inequality tester DU1 disables it since there will be no further need to perform such a test between the outputs of the transaction processors MRA and MRB. In fact, if this were not done, then the inequality tester DU1 would generate an ERD signal causing the deactivation of the system. Similarly, the ERA signal fed to transaction processor MRB "disables" a synchronizing circuit SYNB therein since synchronization is no longer required between the transaction processors MRA and MRB as heretofore described. The "0" output of the ERAF flip-flop ERA' is fed to an input of and unit A41 to prevent the generation of a GERA signal so that no storage address will be generated by the storage address generator SAGA. The ERA' signal will also pass through or unit O4 to the set to "1" input of the REJF flip-flop to initiate a reject routine.

The effect of the REJA signal will now be described. The REJF flip-flop will be set to "1" whenever the non-allowed transaction signal SKRI or the error signal ERA is generated (see FIG. 3). The ERA signal and the SKRI signal are fed via or unit O4 to the set to "1" input of REJF flip-flop. The "1" output thereof is fed via or unit O2 to the set to "0" input of the RSCF flip-flop causing the generation of the RSCNA' signal which is fed to interface IF1 (FIG. 4), for example. This signal will pass via and unit A8 and or unit O5 to one input of and unit A62. The "1" output of REJF flip-flop passes through delay unit D4 to become the REJA signal (FIG. 3) which is also fed to interface IF1. Signal REJA passes via and unit A92 and or unit O91 to the second input of and unit A62 whose output is connected to the set to "1" input of the REJAF flip-flop causing the generation of the REJ signal which is fed to ticket issuing machine TIM1 to unlatch the latched switch. The output of or unit O91 is also fed via or unit O5 to the set to "0" input terminal of daily double DDF flip-flop to prepare it to generate the DD1 signal when a daily double transaction is to be made.

There will now be discussed the generation of the STEP signal when: there is no error; and when no CONA signal has been generated as a result of the valid processing of the first entry of a daily double transaction or the valid processing of any transaction resulting in the issuance of a ticket receipt. If no transaction is sensed or if a non-allowed transaction is sensed it is necessary to step to the next ticket issuing machine without any further processing. The first case is indicated by the presence of the BMD' and TFB signals at inputs of and unit A1 whose output feeds or unit O1. The second case is indicated by the presence of the SKRI signal at a second input of or unit O1. The output of or unit O1 when it transmits a signal in response to a signal received by one of its inputs will cause step pulse generator STP to generate a STEP signal in the usual manner. The role of the STEP signal has been described above.

It should be noted that the scanning is electronically performed and proceeds at high speed whereas the ticket issuing machines are electromechanical and therefore relatively low speed devices. To insure utilization of the

high speed scanning rates the scanners SCA and SCB do not wait until the unlatching of transaction selection switches and the ticket printing is performed before stepping, but, instead, step immediately after initiating these operations. Accordingly, it is possible for the scanners to return to such a ticket issuing machine before the unlatching is complete. Therefore, if no provisions are taken a new transaction will start. Provisions for the prevention of such an error will be described for ticket issuing machine TIM1, which is typical.

Accordingly, it should be noted that as long as a transaction selection switch is latched the BID1 and BID1' signals are generated. It should also be recalled that when the scan stepped at least one of the CONAF or REJAF flip-flops was in the "1" state (see FIG. 4). Therefore, when the SCN1A signal is generated it will pass through or unit O5 to one input of and unit A16 whose other two inputs are connected respectively to the "0" outputs of the CONAF and REJAF flip-flops. If either is set to "1" then and unit A10 will not pass an SCN1, and accordingly no interrogating signal is generated. Therefore, no signals will be on any lines H1A to HNA and the transaction made unit BMA when tested as previously described will not send back a BMD signal to control KA which will immediately generate a STEP signal moving the scan to ticket issuing machine TIM2. In this manner, the rapidly moving scanners can move past the slow operating ticket issuing machines without registering erroneous duplications of the transactions. However, when the transaction switch is finally unlatched the BID1' signal sets the CONAF and REJAF flip-flops (whichever was set to "1" because of a reject or confirm) to the "0" state. The next time the scan reaches ticket issuing machine TIM1 an interrogation will be performed. However, during a daily double transaction, after the first entry is processed the transaction switches will remain latched and remain so until after the second entry is processed. Therefore, the DD1 signal is fed to one input of or unit O17 to override the effect of the "0" output of the CONAF flip-flop.

DESCRIPTION OF THE ELEMENTS OF THE SYSTEMS

Daily double ticket issuing machine TIM1 may be of the type which includes two banks of entry keys each associated with a different entry. Each of these keys when depressed closes a transaction selection switch which latches. Each of the switches is effectively of the single-pole single-throw type having a moving contact electrically connected to a common input line, and a fixed contact connected to a selected output line such as line H11. The common input line for the first bank is the SC1N1 signal line and the common input line of the second bank is the SC2N1 signal line. The outputs of similar transaction selection switches of each bank are connected together to the same output lines. It should be noted that non-daily double ticket issuing machines have only one bank of entry keys and associated transaction selection switches. Such machines receive only the SCN1 signals. Ganged to all these switches is a bid switch which generates BID1 and BID1' signals as long as any transaction selection switch is latched. Included in the ticket issuing machine is an electromechanical ticket issuing and printing mechanism which is energized by the confirming CON signal to print and issue a ticket and unlatch any transaction selection switches. There is also electromechanical means for unlatching the switches upon receipt of a reject REJ signal.

A typical buffer 1A for entry 1 includes the logical elements which satisfy the Boolean equation:

$$(H11+H12 \ldots H1N+CHKA)=H1A$$

where N is associated with the ticket issuing machine TIMN.

A typical scan counter SKA is a chain of conventional cascaded binary counters wherein each binary counter has an output from both its "1" and "0" sides such as those shown in the section entitled Binary Counting, starting on page 194 of "Arithmetic Operations in Digital Computers" by R. K. Richards, published by Van Nostrand, New York in 1955. The output of the first counter would be SK1A and SK1A', etc. These lines are generalized in a single cable referred to as SKNA.

The typical scanner SCA is a decoder which decodes the combinations of "1's" and "0's" from the scan counter SKA. It may be of the type shown in the section entitled Matrices starting at page 71 of the book "Arithmetic Operations in Digital Computers" wherein FIG. 3–3(a) is suitable when extended to the appropriate number of binary counters in scan counter SKA. It should be noted that each letter A, B or C in FIGURE 3–3(a) is associated with a different binary counter stage, i.e., A is associated with the first binary counter stage, B the second, etc. and where an unbarred letter (A) is the "1" output of the binary counter and the barred letter (A) is the "0" output of the binary counter. In the terminology used herein $\bar{A}=A'$.

The console C includes at least a plurality of transaction prevention switches SKW each associated with a different entry upon which no transactions will be accepted. For example, if entry 1 is to be excluded then the appropriate switch SKW1 is closed to transmit a non-transaction signal on the line SKR1 of the SKRN signal line cable. The console C further includes an initial clear switch which generates an ICL signal for clearing various control elements as well as clearing the scan counters SKA and SKB to a start count. The master determining means may be two flip-flops such as the type shown in FIG. 2–15(a) on page 48 of said "Arithmetic Operations in Digital Computers" book, may be employed to generate the AMST and BMST signals, and the AMSTC and BMSTC signals. In one case the "1" output generates the AMST signal and the "0" output the BMST signal. The left hand input (the set to "0" input) receives the ERA signal and the right hand input (the set to "1" input) the ERB signal. These inputs will normally initially receive a signal from a switch for setting up the A master or B master modes. The other case for generating the AMSTC and BMSTC signals is analogous. A logical element such as an and unit will sense for the coincidence of the ERA and ERB signals (the coincidence of these signals can be considered the ambiguity signal) for deactivating the system and giving an alarm. Similarly an and unit is included to test for the coincidence of the CERA and CERB signals (an ambiguity signal) to deactivate the system and give an alarm. The console also includes a three position mode switch SFS which: when in the D position indicates the dual mode; when in the A position causes the generation of the FSA signal indicating simplex mode with A the master; and when in the B position generates the FSB signal indicating simplex mode with B the master.

Inequality tester DU1 is essentially a conventional equality comparator which is disabled by the presence of either the ERA or ERB signals. There are innumerable appropriate types available in the existing art.

For example, a logical element satisfying the following Boolean equation can be employed:

$$[ERA'\cdot ERB']\cdot[(\Sigma AADRAN\cdot AADRBN')+(\Sigma AADRAN'\cdot AADRBN)]=ERD$$

where the summation is for all values of N which are the separate output lines of aggregator address generators. The ERD signal is also fed to an inverter to generate the ERD' signal.

Inequality tester DU2 is a logical element which satisfies the following Boolean equation:

$$[(CERA'\cdot CERB')]\cdot[(POUA'\cdot POUB)+(POUA\cdot POUB')]=CERD$$

The CERD signal is also fed to an inverter to generate the CERD' signal.

The registers MEMA and MEMB are identical and include a multiplane magnetic core matrix which is divided into rows and columns wherein the core in each plane in the same row and column provides a bit storage for a multibit binary number. A group of the registers (aggregator registers) is reserved for aggregating transactions. Other registers are reserved for storing operation and result information of the computer COMA. Included with the registers are typical row and column selectors as well as read and write amplifiers.

Consider now the aggregator registers. Each row of matrix associated with the aggregator registers may be assigned to a different entry and each column to a different ticket issuing machine. Therefore, the AADR signal lines are actually a plurality of lines divided into two groups. The first group are lines associated with the outputs of the particular entry being made and are coupled respectively to the rows. The second group are a plurality of lines associated with the ticket issuing machine being processed. Of course, this can be refined so that each row is associated not with a particular ticket issuing machine but instead with the same category of transaction. For example, in a horse race pari-mutuel system, one row can be associated with all $2 win bets, another row with all $10 place bets, etc. This is a simple matter since each ticket issuing machine generally handles only one such type of bet. Under control of a read signal the bits of the number will be read out of the selected aggregator register as signals on the sense windings connected to the MOA signal lines; passed through a means for updating and returned to the same selected aggregator register under control of a write signal. Such recirculation type magnetic core matrices are well known. For example, typical magnetic core storages may be found in chapter 8 of the book "Digital Computer components and Circuits" by R. K. Richards, published by Van Nostrand, New York, in 1957; or the memory shown in the copending application, Serial No. 223,481, filed Sept. 13, 1962, for an "Information Transfer System" and assigned to the same assignee.

The means for generating the acknowledge signal can be a logical element satisfying the following Boolean equation:

$$MIA1+MIA2+ \ldots +MIAN=ACKA$$

Of course more detailed circuits which include error checking could be employed.

The ticket issuing machine memory MMA is a similar multiplane magnetic core matrix and associated units except its matrix may be considered as having a single row. Of course it can have many rows, each associated with different entries.

All the updating means are unit adders which are similar and many are available in the present art. For example, the binary adder shown in FIG. 4–1 of said book "Arithmetic Operations in Digital Computers" can be slightly modified to serve the purpose. In said figure, lines X_3, X_2, X_1 are equivalent to the outputs of the sense windings of the magnetic core planes as represented by the MOA signal lines and the signals S_3, S_2, S_1 are equivalent to the MIA signals lines. The Y_1 signal line is always maintained at binary "1" while the Y_2 and Y_3 signal lines are always maintained at binary "0."

The computers COMA and COMB are identical and may be considered as internally programmed general purpose computers which can perform the necessary arithmetic operations such as adds computations on the aggregated transactions to produce result information such as pay offs. It should be noted that the computers also generate addresses to select the aggregator registers in addition to its own registers. The computers may include conventional parity checking circuits for generating parity error indicating signals as typical error signals. The typical error unit CERA may be a flip-flop as described above wherein the "1" output generates the CERA signal and the "0" output the CERA' signal. The left hand input would be connected to the ICL line and the right hand input connected to the output of an or unit whose inputs are respectively connected to the CERD signal line and FSB signal line.

The output units can take many forms such as visual display boards, line printers, magnetic tape units, etc.

Since the transaction processors MRA and MRB are identical only transaction processor MRA will be described. The entry register 1HRA can be a plurality of flip-flops like those previously described. The left hand input of each of these flip-flops is connected to the STEP signal line. The right hand input of each of the flip-flops is connected to one of the particular transaction signal lines HNA. The "1" output of each flip-flop is connected to one of the 1HRN signal lines. The "0" output of each flip-flop is connected to one of the 1HRN' signal lines. The entry register 2HRA is similar to the entry register 1HRA, except: the left hand inputs of the flip-flops are connected to the output of and unit A30 (FIG. 2); the right hand inputs are connected via the typical and units A20 and A21 to the 1HR1 . . . 1HRN signal lines. The "1" outputs of the flip-flops are connected respectively to the 2HR1 . . . 2HRN lines.

The end scan test unit ESTA may be a logical element satisfying the following Boolean equation:

$$H1A \cdot H2A \cdot \ldots \cdot HNA \cdot SCNZA=ESR$$

The transaction made unit BMA may be a logical element satisfying the following Boolean equation:

$$(H1A+H2A+ \ldots HNA) \cdot (TFB+RSCNA)=BMD$$

The BMD signal is fed to an inverter to generate the BMD' signal.

The test for non-transaction unit TFSA is a conventional equality comparator which when strobed by the TFS signal will transmit a SKRI signal if an equality exists. Such a comparator could be a logical element satisfying the Boolean equation:

$$(\Sigma 1HRN \cdot SKRN) \cdot TFS=SKRI$$

where the summation is over all values of N. The SKRI signal is fed to an inverter to generate the SKRI' signal.

The two entry transaction unit THBA can be a conventional majority logical element which will transmit a THBI signal when interrogated by a TFT signal if at least two of the 1HRN signals are coincidently present.

If a majority logical element is inconvenient then a logical element which satisfies the following Boolean equation may be employed:

$$TFT \cdot \{[1HR1 \cdot (1HR2+ \ldots +1HRN)] + [1HR3+ \ldots +1HRN)] + [1HR3 \cdot (1HR4 + \ldots +1HRN)] + \ldots + [1HR(N-1) \cdot 1HRN]\} = THBI$$

The THBI signal is fed to an inverter to generate the THBI' signal.

The storage address generator SAGA will be described for only the case of two possible entries solely for simplicity. In such a case, consider races with only entry 1 and entry 2.

The Boolean equations are for group 1:

$$\begin{aligned} GERA \cdot 1HR1 \cdot DD2' &= AADRA1 \\ \ldots \quad \ldots &= \ldots \\ GERA \cdot 1HR2 \cdot 1HR10 \cdot DD2 &= AADRA6 \end{aligned}$$

for group 2

$$\begin{aligned} GERA \cdot DK1 &= AADRA7 \\ \ldots \quad \ldots &= \ldots \\ GERA \cdot DKN &= AADRA(N-6) \end{aligned}$$

where in DKN, N implies the different outputs of decoder DEC.

The decoder DEC is similar to scanner SCA.

The aggregator address transmitter AATA is a logical element satisfying the Boolean equations:

(1) (AADRA1·SADD·AMST) + (AADRB1·SADD·BMST) = AADR1

(M) (AADRAM·SADD·AMST) + (AADRBM·SADD·BMST) = AADRM

(M+1) (AADRAM+1·SADD·AMST) + (AADRBM+1·SADD·BMST) = AADRM1

(N) (AADRAN·SADD·AMST) + (AADRBM·SADD·BMST) = AADRN

The equations (1) to (M) are associated with group 1 and the equations (M+1) to (N) are associated with group 2.

The ticket issuing machine address transmitter WATA is a logical element satisfying the following Boolean equations.

(1) (AADRAM+1·SADD·AMST) + (AADRBM+1·SADD·BMST) = WADR1

(N-M) (AADRAN·SADD·AMST) + (AADRBN·SADD·BMST) = WADR(N-M)

One further comment should be made about the logical elements in the Boolean equations. The symbol "+" implies an or function, the symbol "·" implies an and function and a primed signal implies logical inversion. Many logical elements are available to perform these functions. Typical circuitry for these elements may be found in FIG. 2–2 of said "Arithmetic Operations of Digital Computers" book. In fact, chaper 2 of said book teaches the conversion of Boolean equations to logical elements and the conversion of the logical elements to circuit elements.

The "or" circuit therein can be used for the or units mentioned throughout the specification. The "and" circuit therein can be used for the and units mentioned throughout the specification. In either case non-inverting conventional amplifiers may be connected to the outputs of these units when power amplification is required. When both signals and their inverses are simultaneously required then it may be desirable to employ conventional paraphase amplifiers. The inverters can be conventional signal inverters for inverting direct-current signals. The delay units can be conventional delay elements such as lumped constant delay lines or even delay multivibrators.

Further since the various elements shown in the system are made up of standard components, and standard assemblies, reference may be had to "High Speed Computing Devices," by the staff of Engineering Research Associates, Inc., McGraw-Hill Book Company, Inc., 1950; and appropriate chapters in "Computer Handbook," McGraw-Hill, 1962; edited by Harvey D. Huskey and Granino A. Korn, and for detailed circuitry, to for example "Principles of Transistor Circuits," edited by Richard F. Shea, published by John Wiley and Sons, Inc., New York, and Chapman and Hall, Limited, London, 1953 and 1957. In addition, other references are: for system organization and components: "Logic Design of Digital Computers," by M. Phister, Jr. (John Wiley and Sons, New York); "Arithmetic Operations in Digital Computers," by R. K. Richards (D. Van Nostrand Company, Inc., New York). For circuits and details: "Digital Computer Components and Circuits," by R. K. Richards (D. Van Nostrand Company, Inc., New York).

SUMMARY

The basic system may be summarized as follows: In a system which comprises a plurality of single entry and sequential double entry ticket issuing machines wherein each of said ticket issuing machines comprises:

A plurality of selectively actuatable and latching transaction-selection switches, each associated with a different entry in a race, for transmitting a selected transaction signal associated with the selected entry to an associated output line when the ticket issuing machine receives an interrogating signal,

A rejection signal responsive means for unlatching any latched switches,

An acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch, and

Means for generating a bid signal when any one of said transaction-switches is latched,

A data processor having a common unit and a plurality of pairs of units, each unit of each pair performing the same function as the other unit but with one operating as a master and the other as a slave, said data processor comprising:

(1) a common console means which comprises

(a) a plurality of selectively actuatable transaction-prevention switches for generating non-allowed signals associated with entries upon which transactions will not be allowed,

(b) a master selecting means for selecting which unit of each pair of units is a master and which is a slave and for changing the selection upon receipt of an erroneous-transaction indicating signal from the selected master unit, and

(c) deactivating means for deactivating the system upon receipt of an ambiguity signal or a joint error signal;

(2) one pair of units consisting of first and second scanning means under the control of step signals each comprising

(a) interrogating means for simultaneously interrogating sequentially and periodically each of said ticket issuing machines to determine if it is to perform a transaction as indicated by a latched transaction-selection switch, and

(b) transmitting means for transmitting to the latched switch of a ticket issuing machine with a latched switch an interrogating signal from only the scanning means selected by said master selecting means to be the master scanning means;

(3) first and second pluralities of buffer means, each of said buffer means of each of said pluralities having

(a) one input line connected to one of the associated output lines of each of said ticket issuing machines, and

(b) one output line for transmitting a particular transaction signal indicating that a transaction is desired on a particular one of the entries;

(4) a second pair of units consisting of first and second transaction processing means each connected respectively to the output lines of said first and second pluralities of buffer means for concurrently processing said particular transaction signals, each of said transaction processing means comprising

(a) checking means for checking for erroneous transaction signals and for transmitting an erroneous-transaction indicating signal to said console means so that if the master transaction processing means transmitted said signal, said master selecting means selects the slave transaction processing means to be the master transaction processing means, said checking means comprising

(i) means for testing for the simultaneous presence of more than one particular transaction signal, and

BEST COPY AVAILABLE

(ii) means for testing for the presence of any particular transaction signals during the absence of said interrogating signals,

(b) comparing means for comparing the particular transaction signals with the non-allowed signals to generate a non-transaction signal and a step signal when a particular transaction signal and a non-allowed signal represent the same entry,

(c) rejection means responsive to an erroneous-transaction indicating signal from said checking means or a non-transaction signal from said comparing means for transmitting a rejection signal to the scanned ticket issuing machine with the latched switch,

(d) no transaction made testing means for testing for the absence of the particular transaction signals during the presence of said interrogation signal for generating a step signal if no particular transaction signals are present,

(e) means responsive to a step signal for advancing the associated scanning means,

(f) synchronizing means for synchronizing processing steps between said first and second transaction processing means comprising

(i) means for transmitting a process step-finished signal to the other transaction processing means when a processing step is finished,

(ii) means responsive to the simultaneous presence of process step-finished signals from both transaction processing means for enabling said transaction processing means to proceed to the next processing step, and

(iii) means responsive to an erroneous-transaction indicating signal from said checking means for enabling said synchronizing means,

(g) generating means for generating storage address signals representing the entry associated with the particular transaction signal and representing the particular ticket issuing machine under interrogation only for non-erroneous particular transaction signals,

(h) transferring means responsive to said master selecting means for transferring said storage address signals as aggregator address signals only from the master transaction processing means,

(i) acknowledgment signal transmitting means for transmitting an acknowledgment signal to the interrogated ticket issuing machine with the latched switch for issuing a ticket,

(j) double entry means responsive to a sequential double entry ticket issuing machine comprising

(i) means for first causing an interrogation signal to first cause the generation of a first particular transaction signal associated with the first of the entries and the generation of a second interrogation signal to cause the generation of a second particular transaction signal associated with the second entry,

(ii) means for storing said first particular entry signal, and

(iii) means for activating said generating means only after said first and second particular transaction signals are generated;

(5) testing means for testing for an inequality of the storage address signals generated by said first and second transaction processing means to transmit an ambiguity signal to said deactivating means, comprising

(a) means responsive to an erroneous-transaction indicating signal from the checking means of either of said first and second transaction processing means for disabling said inequality testing means,

(b) means responsive to erroneous-transaction indicating signals from both of said first and second transaction processing means for transmitting a joint error signal to said deactivating means;

(6) a ticket issuing machine memory comprising

(a) a plurality of addressed memory positions each storing the number of transactions made by a ticket issuing machine,

(b) address-selection means for receiving the portion of the storage address signals generated by the master transaction processing means for selecting the particular memory position associated with the ticket issuing machine being interrogated,

(c) reading means for reading out the contents of the selected memory position,

(d) updating means for updating the read-out contents, and

(e) returning means for returning the updated contents to the selected memory position;

(7) a third pair of units consisting of first and second concurrently operating transaction calculating means each comprising

(a) register means having

(i) addressed aggregation registers for storing the aggregations of transactions processed by only the master transaction processing means, and

(ii) other registers for storing operation and result information,

(b) means responsive to the storage address signals generated by said generating means for selecting the addressed aggregation registers represented by the storage address signals,

(c) means for reading out the contents of said selected addressed aggregation register,

(d) means for updating the contents of said selected addressed aggregation register,

(e) means for returning said updated contents to said selected addressed aggregation register,

(f) means for generating an acknowledgment signal which is transferred to the acknowledgment signal responsive means of the interrogated ticket issuing machine when said updated contents are returned to said selected addressed aggregated register, and

(g) a computer for operating on said aggregated transactions to obtain result information, said computer comprising

(i) means for checking for errors in the calculations for transmitting an erroneous-transaction indicating signal to said console means so that if the master transaction calculating means transmitted said signal, said master selecting means selects the slave transaction calculating means to be the master transaction calculating means, and

(ii) means under the control of said master selecting means for transferring the result information as output information from the master transaction calculating means;

(8) means for testing for an inequality of the result information of said computers for transmitting an ambiguity signal to said deactivating means comprising

(a) means responsive to an erroneous-transaction indicating signal from the computer error checking means of either the first or second transaction calculating means for disabling said computer inequality testing means; and

(b) means responsive to erroneous-transaction signals from both of said first and second transaction calculating means for transmitting a joint error signal to said deactivating means;

(9) information display means for receiving and displaying the output information transferred from said master transaction calculation means; and

(10) means for preventing the reinterrogating of a ticket issuing machine which has received an acknowledgement signal or a rejection signal until the bid signal generated by said ticket issuing machine terminates.

While the system has been described for single entry and

daily double transactions, it can easily be modified to handle other multiple entry transactions such as parlays and quinellas in animal racing parlance.

Furthermore, although the processing of a daily double transaction has been described as being performed by two consecutive scan arounds to the same ticket-issuing machine it is equally possible on one scan to interrogate the ticket issuing machine twice to process the transaction before stepping off to the next ticket issuing machine.

It should also be noted that such a system can not only be employed locally to service a single track for all transactions made at that track but can also be employed to service ticket issuing machines located at "off track" installations. Furthermore, the system can be employed to service a plurality of tracks simultaneously both for "on track" and "off track" betting transactions. In such a case, multientry transactions such as parlays need not be restricted to only animals running at the same track.

While only one embodiment of the invention has been shown and described in detail, it will now be apparent to those skilled in the art that many modifications and variations may be made which do not depart from the appended claims.

What is claimed is:

1. A data processor for processing transaction signals comprising:
   (A) a plurality of pairs of units, each unit of each pair performing the same function as the other unit but with one operating as a master unit and the other as a slave unit,
   (B) a master selecting means for selecting which unit of each pair of units is a master and which is a slave and for changing the selection upon receipt of an erroneous-transaction indicating signal only from the selected master unit, and
   (C) checking means responsive to transaction signals being processed in each unit of a pair of units for checking for erroneous transaction signals and for transmitting an erroneous-transaction indicating signal to said master selecting means so that if the master unit caused said erroneous-transaction signal, said master selecting means then selects the slave unit to be the master unit.

2. In a system which comprises a plurality of machines wherein each of said machines comprises a plurality of selectable signal generators for transmitting a selected transaction signal to an associated output line, a data processor for processing transaction signals comprising:
   (A) a plurality of pairs of units, each unit of each pair performing the same function as the other unit but with one operating as a master and the other as a slave,
   (B) a master selecting means for determining which unit of each pair of units is a master and which is a slave and for changing the selection upon receipt of an erroneous-transaction indicating signal from the selected master unit,
   (C) connecting means for connecting said master and slave units respectively to the output lines of said machines for concurrently processing said particular transaction signals, and
   (D) checking means responsive to transaction signals being processed in each unit of a pair of units for checking for erroneous transaction signals and for transmitting an erroneous-transaction indicating signal to said master selecting means so that if the master unit caused said erroneous-transaction signal, said master selecting means selects the slave unit to be the master unit.

3. In a system which comprises a plurality of machines wherein each of said machines comprises a plurality of switches for transmitting a selected transaction signal to an associated output line, a data processor for processing transaction signals comprising:
   (A) a plurality of pairs of units, each unit of each pair performing the same function as the other unit but with one operating as a master and the other as a slave, and
   (B) a master selecting means for determining which unit of each pair of units is a master and which is a slave and for changing the selection upon receipt of an erroneous-transaction indicating signal from the selected master unit,
   (C) one pair of units comprising first and second transaction processing means each connected respectively to the output lines of said machines for concurrently processing said selected transaction signals,
   (D) each of said transaction processing means including checking means responsive to transaction signals being processed in its associated transaction processing means for checking for erroneous transaction signals and for transmitting an erroneous-transaction indicating signal to said master selecting means so that if the master transaction processing means transmitted said signal, said master selecting means then selects the slave transaction processing means to be the master transaction processing means.

4. The apparatus of claim 3 further comprising another pair of units consisting of first and second concurrently operating transaction calculating means each comprising
   (A) addressed aggregation registers for storing the aggregations of transactions, and
   (B) a computer for operating on said aggregated transactions to obtain result information, said computer comprising error checking means for checking for errors in the calculations for transmitting an erroneous-transaction indicating signal to said master selecting means so that if the master transaction calculating means transmitted said signal, said master selecting means selects the slave transaction calculating means to be the master transaction calculating means.

5. The apparatus of claim 4 wherein said first and second concurrently operating transaction calculating means are each responsive only to processed transaction signals transmitted from the master transaction processing means.

6. The apparatus of claim 4 further comprising another pair of units consisting of first and second scanning means each comprising
   (A) interrogating means for simultaneously interrogating sequentially and periodically each of said machines to determine if it is to perform a transaction as indicated by an operated switch, and
   (B) transmitting means for transmitting to the operated switch an interrogated signal from only the scanning means selected by said master selecting means to be the master scanning means.

7. The apparatus of claim 6 wherein said computer further comprises
   (A) transferring means under control of said master selecting means for transferring the result information as output information from the master transaction calculating means, and
   (B) information display means for receiving and displaying the output information transferred from said master transaction calculating means.

8. The apparatus of claim 7 further comprising first and second pluralities of buffer means, each of said buffer means of each of said pluralities having
   (A) one input line connected to one of the associated output lines of each machine, and
   (B) one output line connected to one of the first and second transaction processing means.

9. The apparatus of claim 3 wherein each of said first and second transaction processing means further comprises synchronizing means for synchronizing processing steps between said first and second transaction processing means comprising
   (A) means for transmitting a process step-finished signal from one to the other transaction processing means when a processing step is finished, and

(B) means responsive to the simultaneous presence of process step-finished signals from both transaction processing means for enabling said transaction processing means to proceed to the next step.

10. The apparatus of claim 1 further comprising

(A) testing means for simultaneously testing the output data of a pair of units and producing an ambiguity signal when said output data is unequal, and

(B) deactivating means for deactivating the data processor in response to an ambiguity signal.

11. The apparatus of claim 4 further comprising

(A) first testing means for simultaneously testing the processed data from said first and second transaction processing means and producing an ambiguity signal when said processed data is unequal,

(B) second testing means for simultaneously testing the result information produced by said first and second transaction calculating means and producing an ambiguity signal when said result information is unequal, and

(B) deactivating means responsive to an ambiguity signal for deactivating the system.

12. The apparatus of claim 4 wherein each of said transaction processing means further comprises

(A) generating means for generating storage address signals representing the selected transaction and the particular machine under interrogation, and

(B) means responsive to the storage address signals generated by said generating means for selecting the addressed aggregation registers.

13. The apparatus of claim 12 wherein said first and second transaction calculating means each further comprises

(A) means for reading out the contents of the selected addressed aggregation register,

(B) means for updating the contents of said selected addressed aggregation register,

(C) means for returning said updated contents to said selected addressed aggregation register, and

(D) means for transmitting an acknowledgement signal to the master transaction processing means when said updated contents are returned to said selected addressed aggregation register.

14. The apparatus of claim 9 further comprising means responsive to an erroneous-transaction indicating signal from said checking means for disabling said synchronizing means.

15. The apparatus of claim 10 further comprising means responsive to an erroneous-transaction indicating signal from said checking means for disabling said testing means.

16. The apparatus of claim 11 further comprising means responsive to an erroneous-transaction indicating signal for disabling said first testing means if said signal is transmitted by the checking means of either transaction processing means and for disabling said second testing means if said signal is transmitted by the error-checking means of either transaction calculating means.

17. The apparatus of claim 1 further comprising

(A) means responsive to erroneous-transaction signals from each unit of a pair of units for producing a joint error signal, and

(B) deactivating means responsive to a joint error signal for deactivating the data processor.

18. The apparatus of claim 4 further comprising

(A) means responsive to erroneous-transaction indicating signals from both of said first and second transaction processing means for producing a joint error signal,

(B) means responsive to erroneous-transaction indicating signals from both of said first and second transaction calculating means for producing a joint error signal, and

(C) deactivating means responsive to a joint error signal for deactivating the system.

19. The apparatus of claim 3 wherein each of said machines also comprises a rejection device for rejecting a transaction, said apparatus further comprising means responsive to an erroneous-transaction indicating signal transmitted from said checking means for operating said rejection device.

20. A system comprising

(A) a plurality of ticket issuing machines wherein each of said ticket issuing machines comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch,

(B) generating means responsive to said selected transaction signal for generating signals representing the entry associated with the particular transaction signal and representing the particular ticket issuing machine, and

(C) transaction calculating means for performing a calculation on said generated signals and transmitting an acknowledgement signal to said acknowledgement signal responsive means for issuing a ticket only if the transaction is correct.

21. The system of claim 20 wherein said transaction calculating means comprises

(A) register means having addressed aggregation registers for storing the aggregations of transactions,

(B) means responsive to the signals generated by said generating means for selecting the addressed aggregation register,

(C) means for reading out the contents of said selected addressed aggregation register,

(D) means for updating the contents of said selected addressed aggregation register,

(E) means for returning said updated contents to said selected addressed aggregation register, and

(F) means for transmitting said acknowledgement signal to the acknowledgement signal responsive means when said updated contents are returned to said selected addressed aggregation register.

22. The system of claim 20 further comprising a ticket issuing machine memory comprising

(A) a plurality of addressed memory positions each storing the number of transactions made by a ticket issuing machine,

(B) address-selection means for receiving the signals generated by said generating means for selecting the particular memory position associated with the particular ticket issuing machine,

(C) reading means for reading out the contents of the selected memory position,

(D) updating means for updating the read-out contents, and

(E) returning means for returning the updated contents to the selected memory position.

23. A system comprising

(A) a plurality of ticket issuing machines wherein each of said ticket issuing machines comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) a rejection signal responsive means for unlatching any latched switches,

(3) and an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch,

BEST COPY AVAILABLE

(B) switch means which comprises a plurality of selectively actuatable transaction-prevention switches for generating non-allowed signals associated with entries upon which transactions will not be allowed,

(C) comparing means for comparing the selected transaction signal with the nonallowed signals to generate a nontransaction signal when a particular transaction signal and a nonallowed signal represent the same entry,

(D) rejection means responsive to a nontransaction signal from said comparing means for transmitting a rejection signal to the rejection signal responsive means of the ticket issuing machine for unlatching any latched switches, and

(E) means for transmitting an acknowledgement signal to the acknowledgement signal responsive means of the ticket issuing machine for issuing a ticket only if the selected transaction is allowed.

24. A system comprising:

(A) a plurality of ticket issuing machines each including a plurality of selectively actuatable transaction selection switches each associated with a different entry for transmitting when actuated a selected entry transaction signal associated with a selected entry to an output line when the ticket issuing machine receives an interrogation signal,

(B) scanning means for sequentially and periodically selecting each of the ticket issuing means for interrogation,

(C) interrogating means for generating an interrogation signal for transmission to the selected ticket issuing machine,

(D) sensing means for sensing for a selected entry transaction signal, and

(E) means for stepping said scanning means to the next ticket issuing machine when said sensing means does not sense a selected entry transaction signal.

25. The system of claim 24 further comprising means for processing a selected entry transaction signal sensed by said sensing means before the stepping of said scanning means to select the next ticket issuing machine.

26. A system comprising:

(A) a ticket issuing machine which comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry for transmitting a selected entry transaction signal associated with the selected entry to an associated output line,

(2) a rejection signal responsive means for unlatching any latched switches upon receipt of a rejection signal, and

(3) an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch,

(B) entry checking means for checking for erroneous selected entry transaction signals and for transmitting a rejection signal to said ticket issuing machine when erroneous selected entry transaction signals are sensed, and

(C) means for transmitting acknowledgement signals to said ticket issuing machine when the selected entry transaction signal is correct.

27. The system of claim 26 wherein said entry checking means comprises means for sensing for the simultaneous presence of more than one selected entry transaction signal.

28. The system of claim 26 wherein said ticket issuing machine transmits a selected entry transaction signal only in response to an interrogating signal, said system further comprising interrogating means for producing interrogating signals, said checking means further comprising means for sensing for the presence of a selected entry transaction signal when the interrogating signal is not present.

29. A system comprising:

(A) a plurality of ticket issuing machines each including

(1) a plurality of selectively actuatable and latching transaction selection switches each associated with a different entry for transmitting when latched a selected transaction signal associated with a selected entry when the ticket issuing machine receives an interrogation signal,

(2) means for generating a bid signal as long as any one of the transaction selection switches is latched, and

(3) acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to the selected entry and for unlatching any latched transaction selection switches,

(B) scanning means for sequentially and periodically selecting each of the ticket issuing means for interrogation,

(C) interrogating means for generating an interrogation signal for transmission to the selected ticket issuing machine,

(D) means for processing the selected transaction signal and for generating an acknowledgement signal for transmission to the selected ticket issuing machine to issue said ticket and unlatch any latched transaction selection switches, and for stepping said scanning means to select the next ticket issuing machine, and

(E) means for preventing said interrogating means from transmitting an interrogating signal to a ticket issuing machine which has received an acknowledgement signal until the termination of the bid signal.

30. The system of claim 29 further comprising

(A) sensing means for sensing for a selected transaction signal, and

(B) means for stepping said scanning means to select the next ticket issuing machine when said sensing means does not sense a selected transaction signal.

31. A system for recording a multientry transaction related to one entry selected from each of two groups of entries comprising:

(A) transaction signal generation means for generating a first entry transaction signal representing the entry selected from the first group of entries and a second entry transaction signal representing the second entry selected from the second group of entries,

(B) storage means responsive to said transaction signal generation means for storing the first entry transaction signal,

(C) address generation means responsive to said transaction signal generation means and said storage means for generating a storage address signal related to the first and second entry transaction signals, and

(D) addressed storage registers responsive to said address generation means for storing the multientry transaction in the particular addressed storage register represented by the storage address signals generated by said address generation means.

32. The system of claim 31 further comprising:

(A) interrogation means for sequentially interrogating said transaction signal generating means, and transaction selection means for first selecting the first entry transaction for interrogation and then selecting the second entry transaction for interrogation,

(B) said storage means being only responsive to said transaction signal generation means when said transaction selection means selects the first entry transaction.

33. The system of claim 32 wherein said address generation means is responsive to said transaction selection means to generate a storage address signal only after said

25

transaction selection means selects the second entry transaction.

References Cited by the Examiner

UNITED STATES PATENTS

2,345,212	3/1944	Nelson	235—92
3,029,414	4/1962	Schrimpf	340—172.5
3,034,714	5/1962	Heisel et al.	235—92
3,047,223	7/1962	Lange	235—92
3,051,384	8/1962	Lange	235—92
3,061,192	10/1962	Terzian	235—157

FOREIGN PATENTS

749,836	6/1956	Great Britain.

26

OTHER REFERENCES

Pages 4–1 to 4–4, November 1949, Functional Description of the EDVAC, published by the University of Pennsylvania, Vol. 1.

Pages 101–107, December 1959, Chao: The System Organization of MOBIDIC, Proceedings of the Eastern Joint Computer Conference, No. 16.

Pages 32–78, 1961, Gass: Project Mercury Real-Time Computational and Data Flow System, Proceedings of the 1961 Eastern Joint Computer Conference. Vol. 20. QA 76 E3 C.9.

ROBERT C. BAILEY, *Primary Examiner.*

MALCOLM A. MORRISON, *Examiner.*

P. J. HENON, *Assistant Examiner.*

A31

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,252,149 May 17, 1966

Robert L. Weida et al.

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

In the drawings, Figure 1A, change "FTA" to -- TFA --; Figure 1A, change "FTB" to -- TFB --; Figure 1A, change "M2B" to -- HNB --; Figure 2, delete the line connected between line "SADD" and element "AATA"; Figure 2, insert a line connecting line "SADD" and element "WATA"; Figure 2, insert a line connecting line "AADRB" and element "WATA"; Figure 2, change "FTA" to -- TFA --; Figure 2, change "FTB" to -- TFB --; Figure 3, the line DD1 connected to gate A41 should read -- DD1′ --. Column 1, line 28, after "pairs" insert -- of --; line 51, "a more versatile system. Briefly, in view of this" should read -- a high speed scanning means for interrogating --. Column 3, line 32, "this signal such as the BID1′ signal." should read -- the signal such as the BID1 signal. However, --; line 49, after "not" insert -- the SCN¹B signal from --; line 59, "preset" should read -- presets --. Column 6, line 62, "REJF" should read -- REJAF --. Column 8, line 34, "A14" should read -- A16 --; line 41, "CONFA" should read -- CONAF --. Column 9, line 62, "BNA" should read -- NA --. Column 10, line 28, "ERA" should read -- ERA′ --; line 31, "ERA′" should read -- ERA --. Column 12, line 19, "barrel" should read -- barred --. Column 13, line 73, "CERA" should read -- ERCA --. Column 15, line 36, "convention" should read -- conventional --. Column 16, line 15, "units" should read -- unit --. Column 17, line 67, cancel the period and insert -- , comprising --.

Signed and sealed this 16th day of December 1969.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

A320 .

POL-90
5-9-61

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

All communications concerning this application should give the serial number, date of filing, and name of the applicant.

PAPER No. 1

Applicants: [illegible] et al	Mailed
Ser. No. [illegible],247	
Filed [illegible]. 29, 1963	Aug. 15 1963
For [illegible] SYSTEM	

C. C. Yuter
485 Lexington Ave.,
New York 17, N. Y.

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents.

This application has been examined.

References cited:

Nelson	2,345,212	Mar. 28, 1944		235-92ST
Schrimpf	3,029,414	Apr. 10, 1962		340-172.5
Helsel et al	3,034,714	May 15, 1962		235-92 T
Lange I	3,047,223	July 31, 1962		235-92RT
Lange II	3,051,384	Aug. 28, 1962		235-92 T
Torsion	3,061,192	Oct. 30, 1962		235-157
(British)	749,836	June 6, 1956		

(pp. 84-92 and 271-276 relied on, copy in Group 240)

Other references:

Functional Description of the EDVAC, published by the University of Pennsylvania, Vol. 1, Nov. 1949 (pp 4-1 to 4-4, copy in Group 240)

Chao,: The System Organization of CADIC. Proceedings of the Eastern Joint Computer Conference, No. 16, Dec. 1959, pp. 101-107, copy in Group 240

Gass, Project Mercury Real-Time Computational and Data Flow System, Proceedings of the 1961 Eastern Joint Computer Conference, Vol. 20, AA 76 23 C.9 (pp. 33-78 relied on)

1. At the direction of the Director of the Electrical Examining Operation, this application is being taken out of turn for examination in accordance with applicants' petition for the purpose of determining adequacy of disclosure. Since the Examiner has found the disclosure adequate to support the claimed subject

PLAINTIFF'S
EXHIBIT
2

BEST COPY AVAILABLE

matter, the application is made special only for the first action.

2. This application has not been examined to the extent necessary to discover all minor errors. Applicants' cooperation is, therefore, requested in pointing out any errors of which they may become aware.

3. The claims in this case are 1-34, inclusive.

4. Claims 1-19 and 29-30 are rejected as vague and indefinite. In claim 1 for example, "erroneous transmission signals" lack proper antecedent basis. Is the signal transmitted by the checking means the same as the signals received? Does the master selecting means change the selection due to receipt of a signal from the master units or from the checking means? The claims are further vague and indefinite in that they recite, at numerous locations, means for performing a plurality of functions, but fail to recite sufficient structure for performing said functions. The recitation in claim 29, for example, of "means for processing --- and for generating --- and units --- and for stepping --- machine", as presently recited, is merely a functional statement of the desired results.

5. Claims 1-5, 9-10, 14 and 15, and 17-18, as understood, are further rejected as fully met by the Chao publication which incorporates the Verdon patent. The reference shows a data processing system which includes a plurality of pairs of units which may be programmed to; simultaneously process the same problem on both pairs of units (thus duplicating the computation); check

A322.

Serial No. [illegible] -3-

for memory in each unit; and allow the non-erroneous unit to [illegible] minute.

6. Claims 1-34, as understood, are further rejected as unpatentable over the Chao publication in view of Schrimpf and the British patent. It would appear that applicants have done no more than to select a plurality of individual features from the prior art such as duplexing of equipment as shown by Chao, sequentially scanning a plurality of peripheral devices as shown by Schrimpf, and various error checking features as shown by the British patent, and have incorporated them into a unitary data processing system. Said system, even though an improved one for the desired use, is not unobvious to one of ordinary skill in the data processing art.

7. Claims submitted for further consideration should be reviewed in light of all the references cited.

8. Claim 34 is rejected as obviously non-statutory, note 35 USC 112.

9. Claims 1-34 stand rejected.

Examiner

JJMenon:flb

SUBMITTED

AUG 15 1963

DIRECTOR
EXAMINING OPERATION II

BEST COPY AVAILABLE

CONTROL PATHS
WIN
2B
BMB
RAM #1 OF 12
$2 TIMS
$5 TIMS
$10 TIMS
$50 TIMS
$100 TIMS
$2 COLLECTOR
BM COLLECTOR
WIN TAM
2B
5B
10B
50B
100B
CONTROL PATHS
PLACE
2B
BMB
RAM #1 OF 12
COLLECTORS
#2 PLACE
BM PLACE
PLACE TAM
2B
5B
COMBINE UNIT
CONTROL PATHS
SHOW
2B
BMB
RAM #1 OF 12
COLLECTORS
$2 SHOW
BM SHOW
SHOW TAM
2B
5B
COMBINE COLLECTOR
$4 COMB TIM
$6 COMB TIM
$10 COMB TIM
$15 COMB TIM

A324

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 2

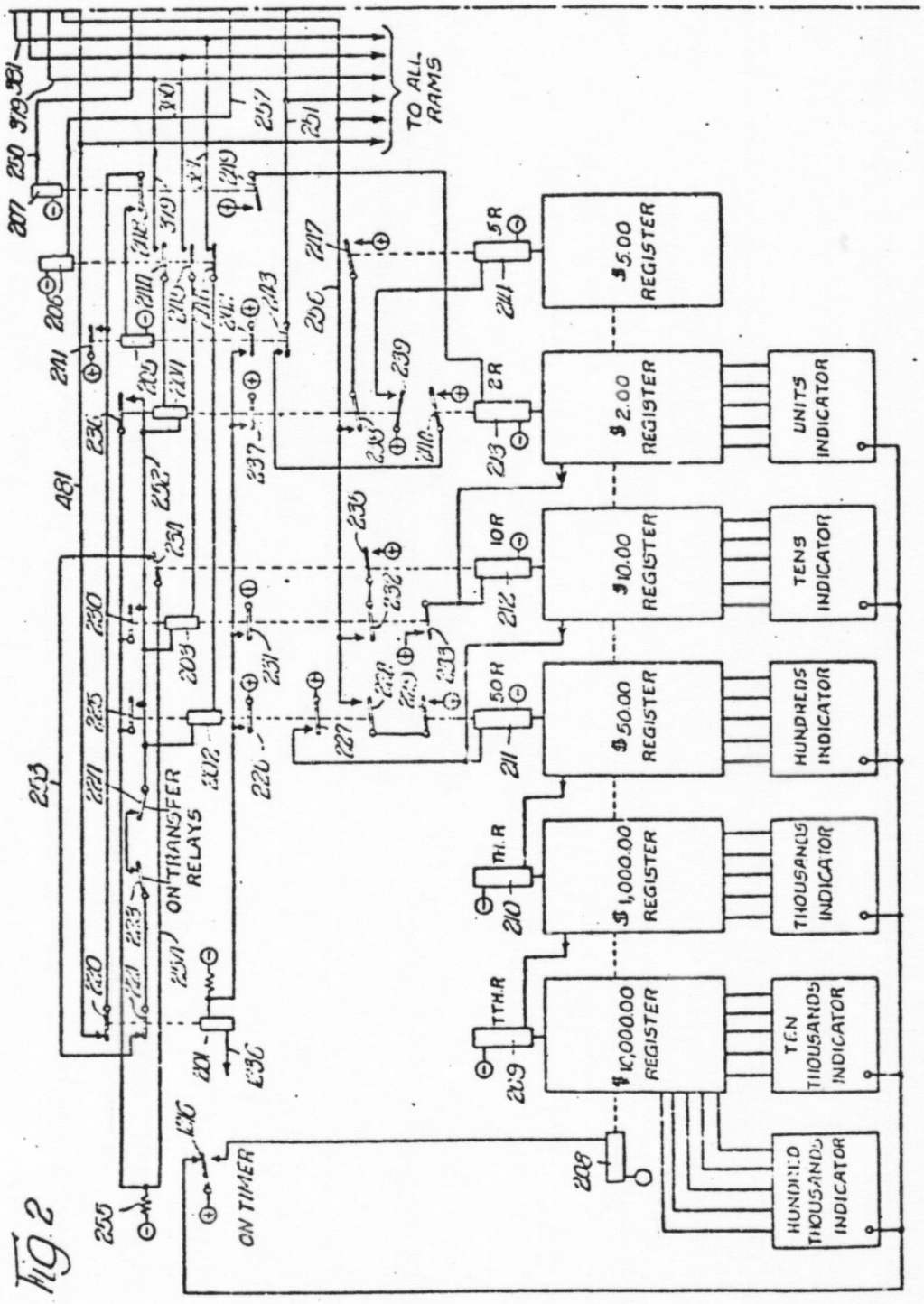


Fig. 2

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 3

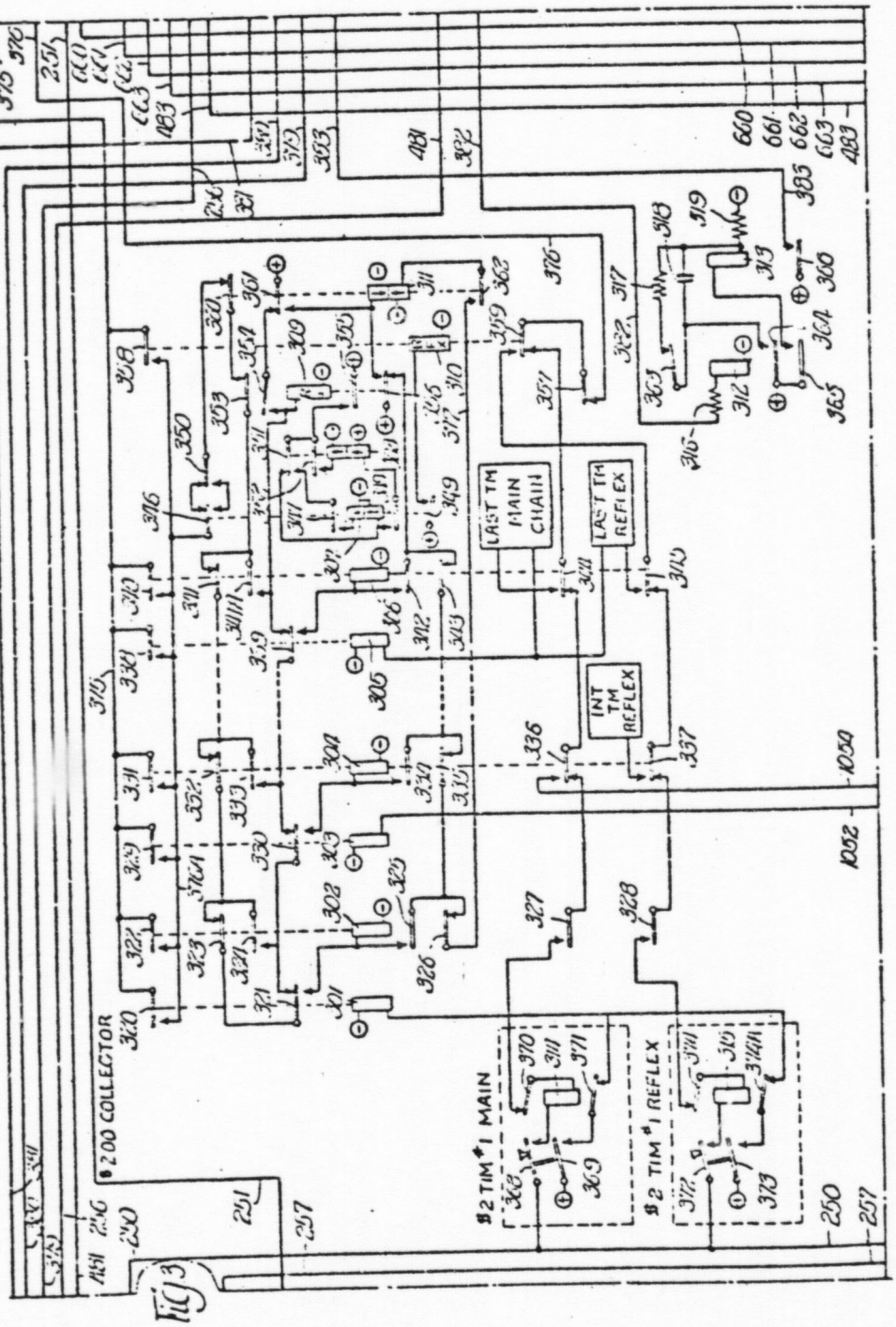


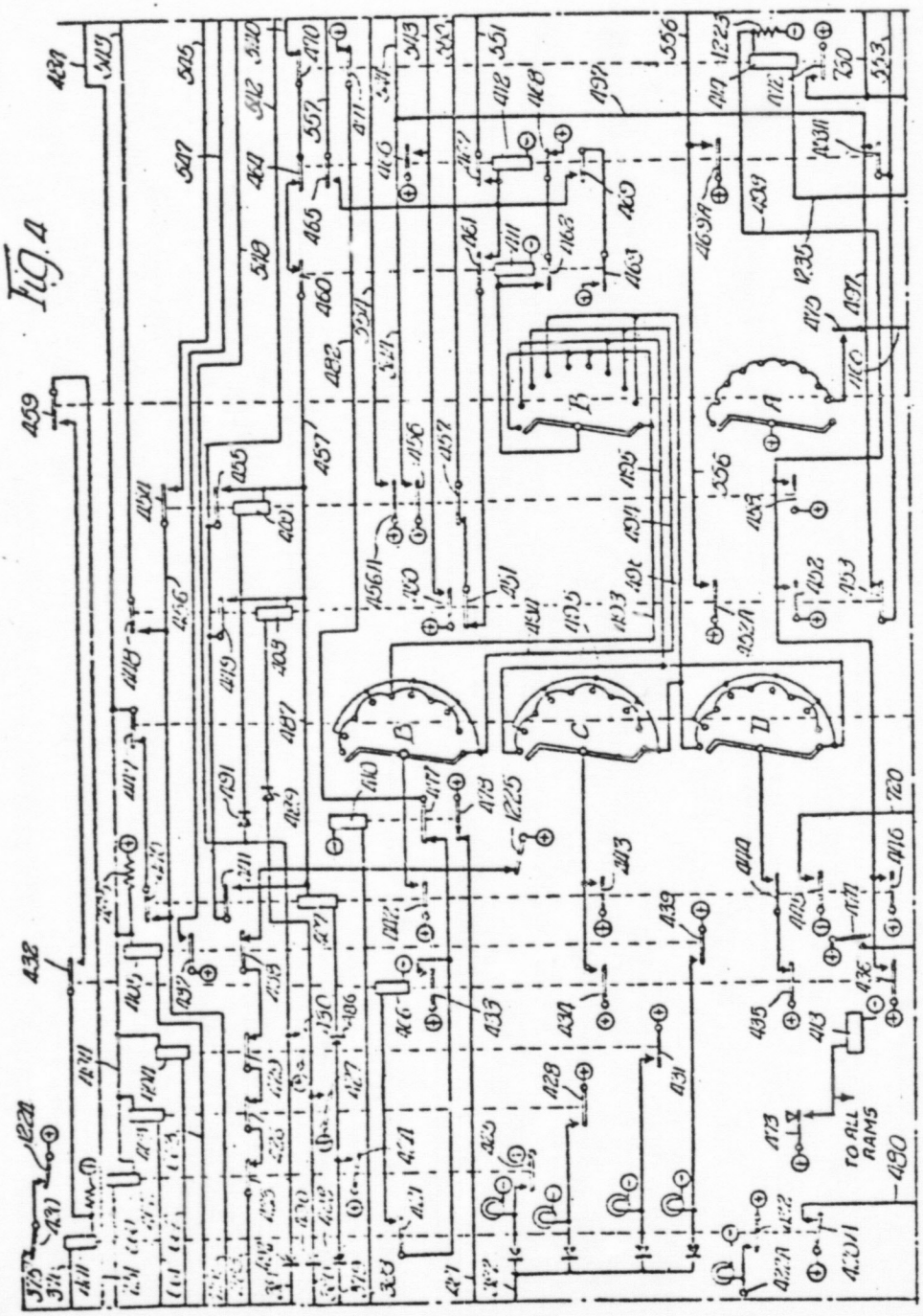
Fig 3

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 4

Fig. 4



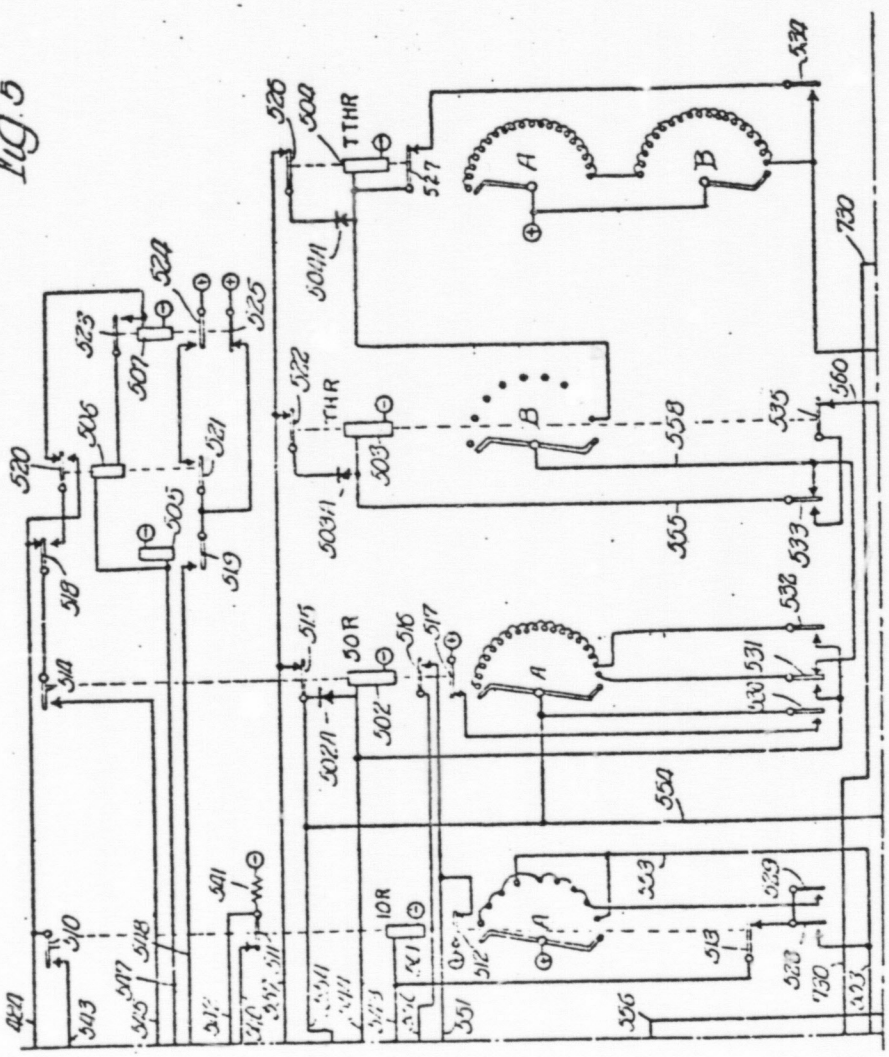
A-321

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 5

Fig. 5



A-328

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 6

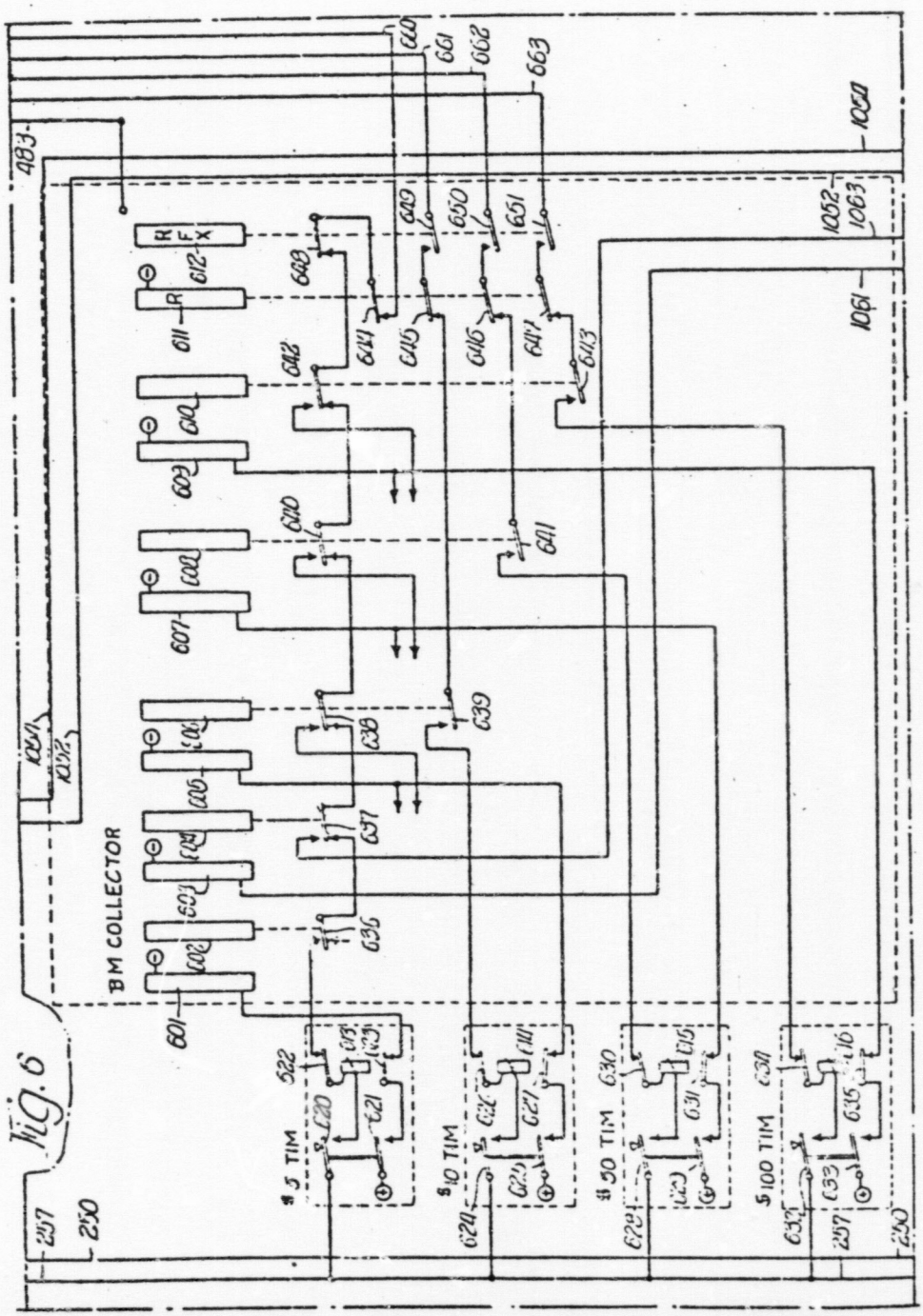


FIG. 6

A-329

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 7

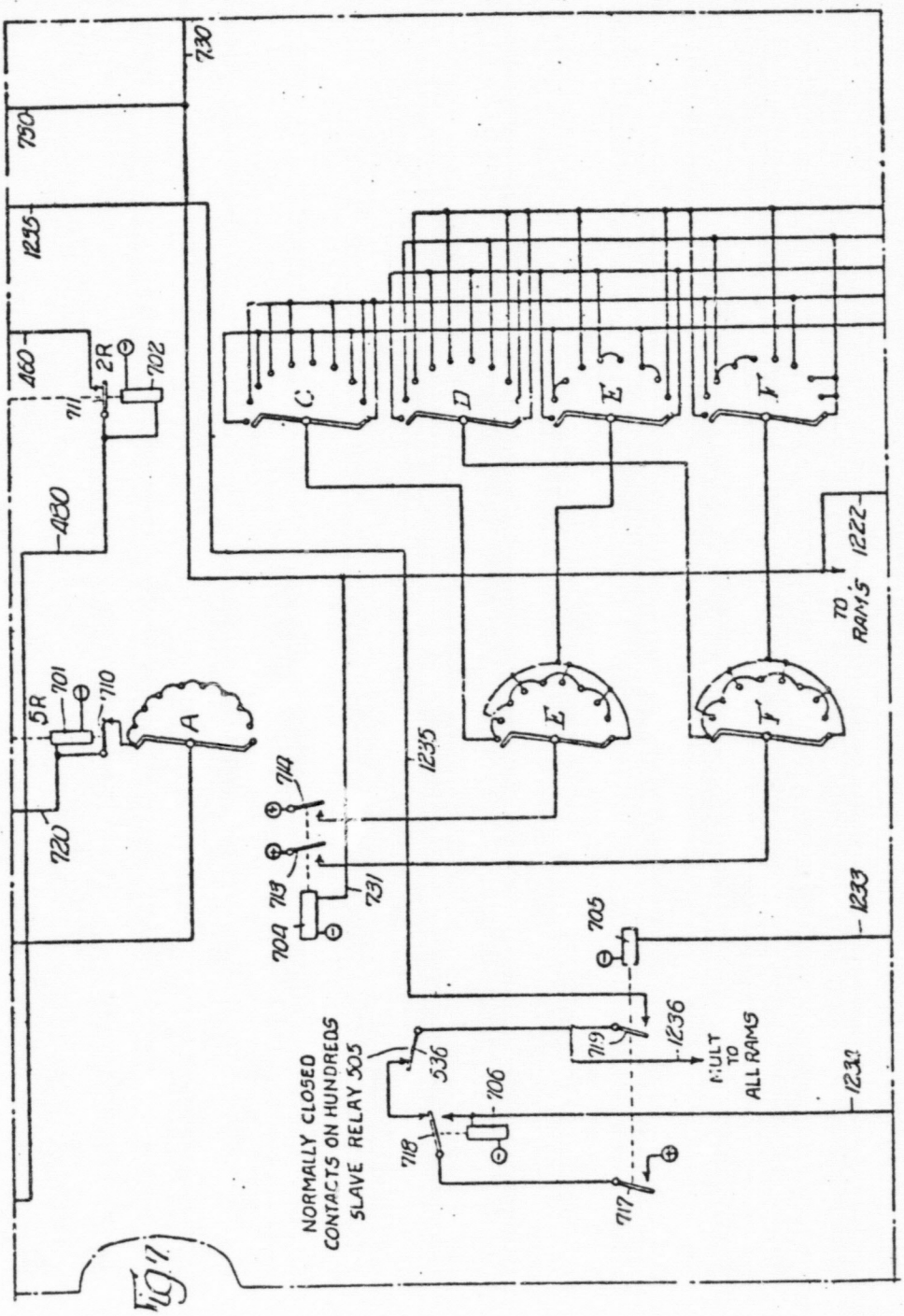


Fig. 11

A330

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 2, 1959 14 Sheets-Sheet 8

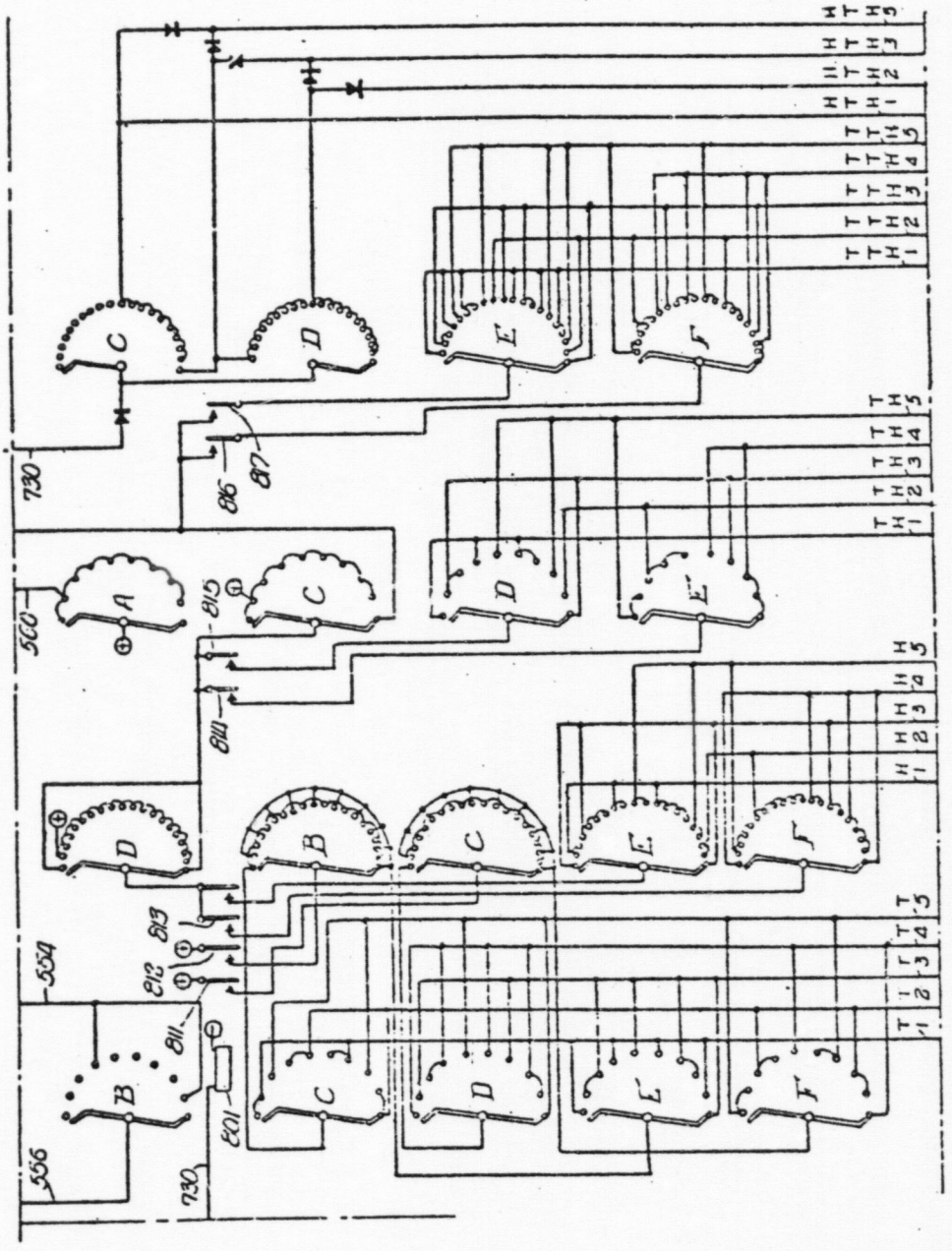


Fig. 8.

A-331

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 9

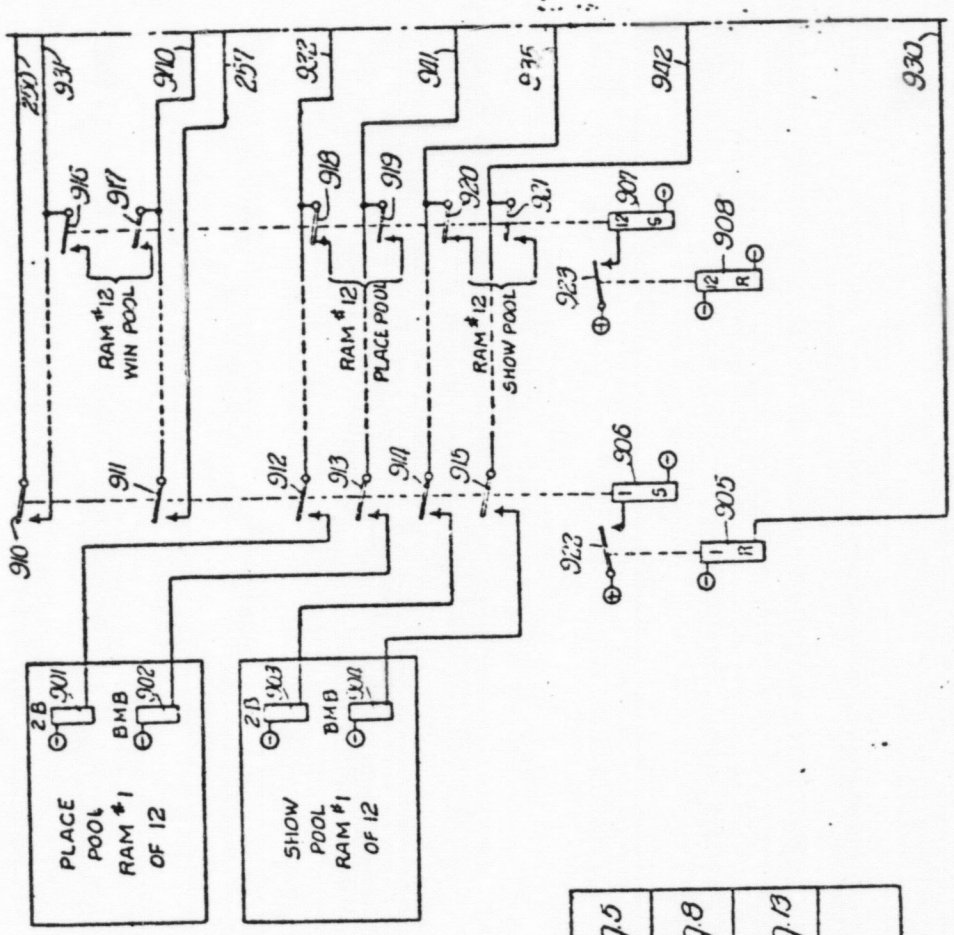


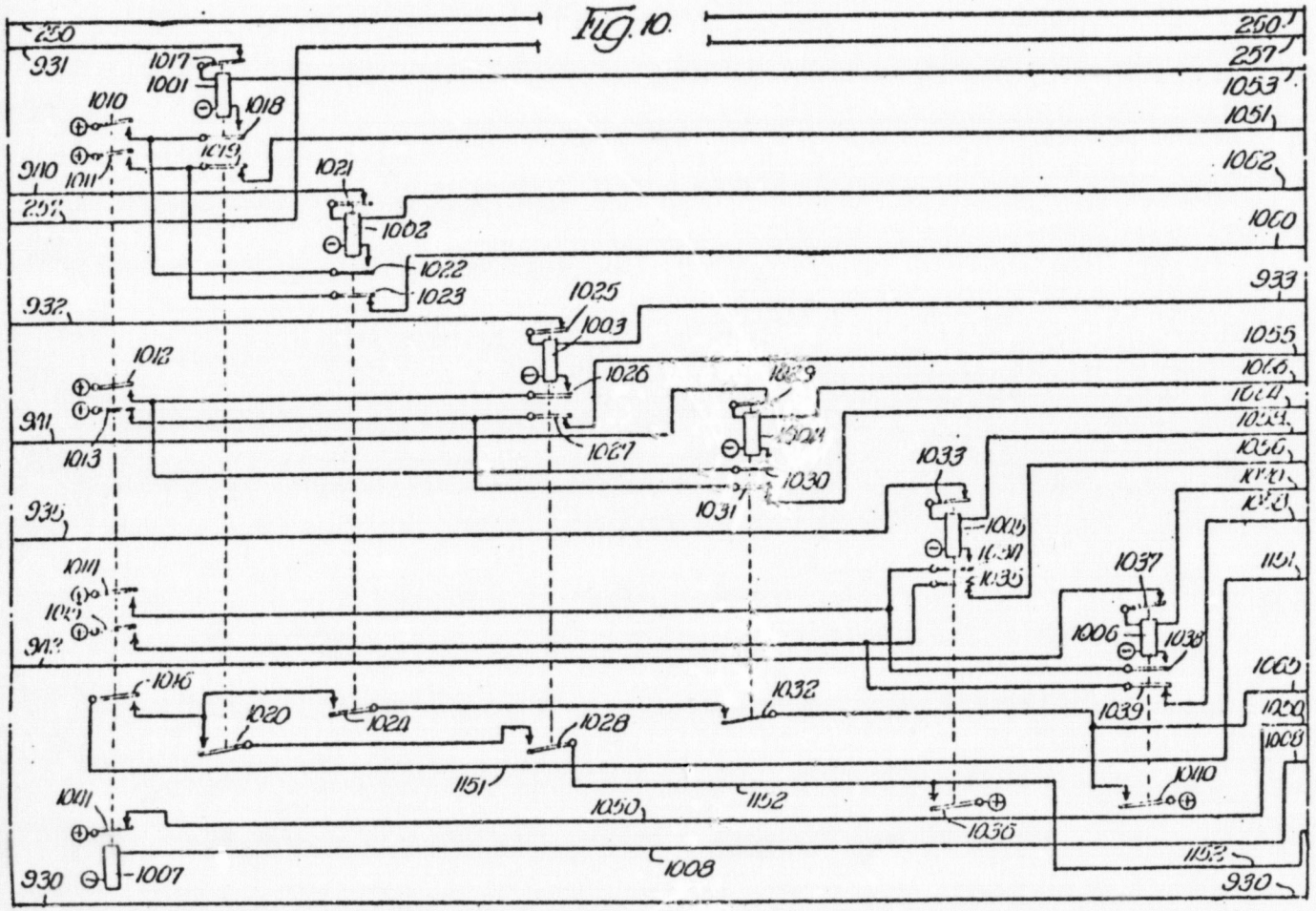
Fig. 9.

Fig. 17

Fig. 1	Fig. 2	Fig. 3	Fig. 4	Fig. 5	
		Fig. 6	Fig. 7	Fig. 8	
Fig. 9	Fig. 10	Fig. 11	Fig. 12	Fig. 13	
		Fig. 14			

A 332

Fig. 10.



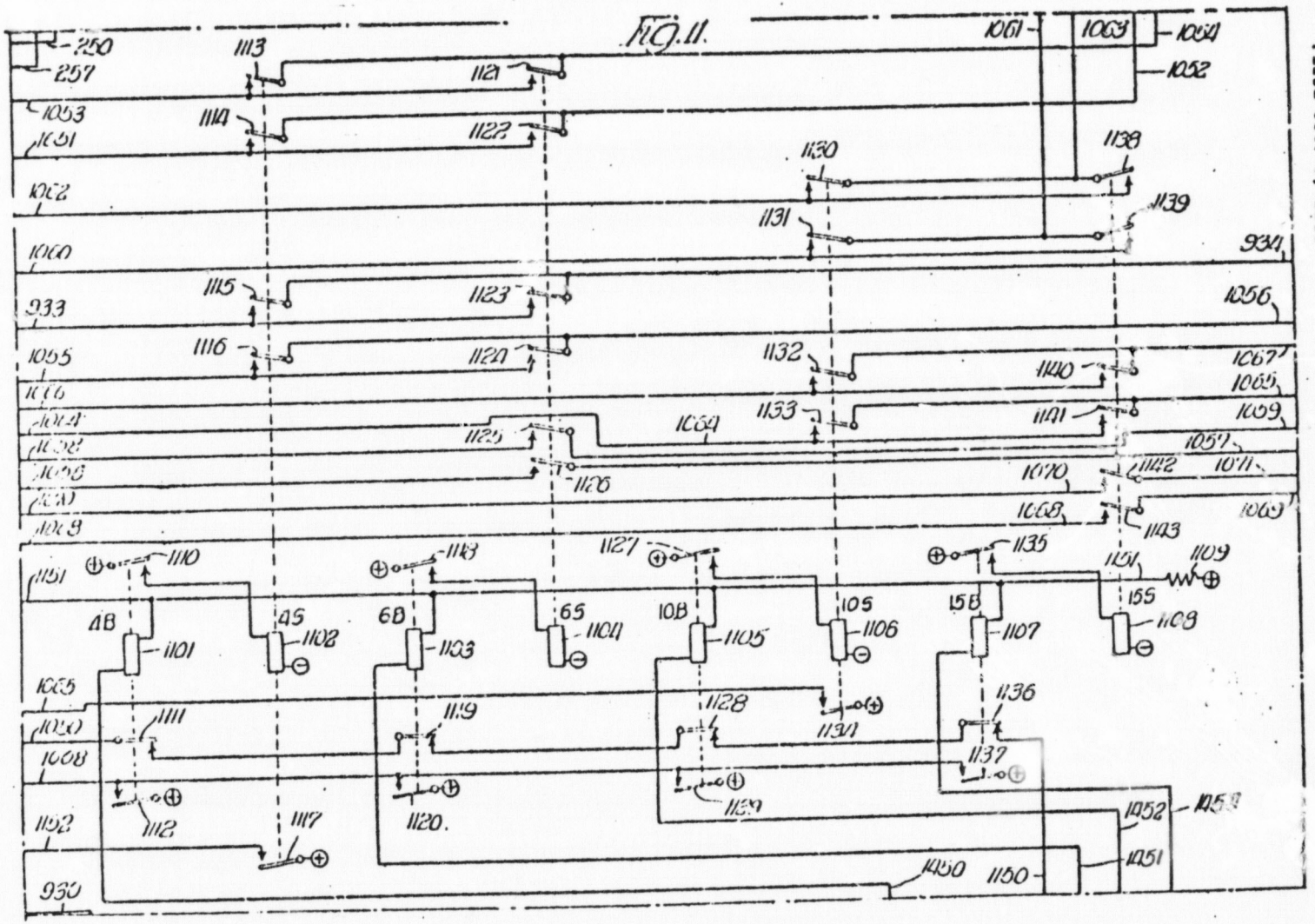
Aug. 28, 1962 LE ROY J. LANGE 3,051,384

Filed Oct. 9, 1959 TOTALISATOR SYSTEM 14 Sheets-Sheet 10

A-333

Aug. 28, 1962 LE ROY J. LANGE 3,051,384
TOTALISATOR SYSTEM
Filed Oct. 9, 1959 14 Sheets-Sheet 11

FIG. 11.



A334

Aug. 28, 1962 LE ROY J. LANGE 3,051,384

TOTALISATOR SYSTEM

Filed Oct. 9, 1959 14 Sheets-Sheet 12

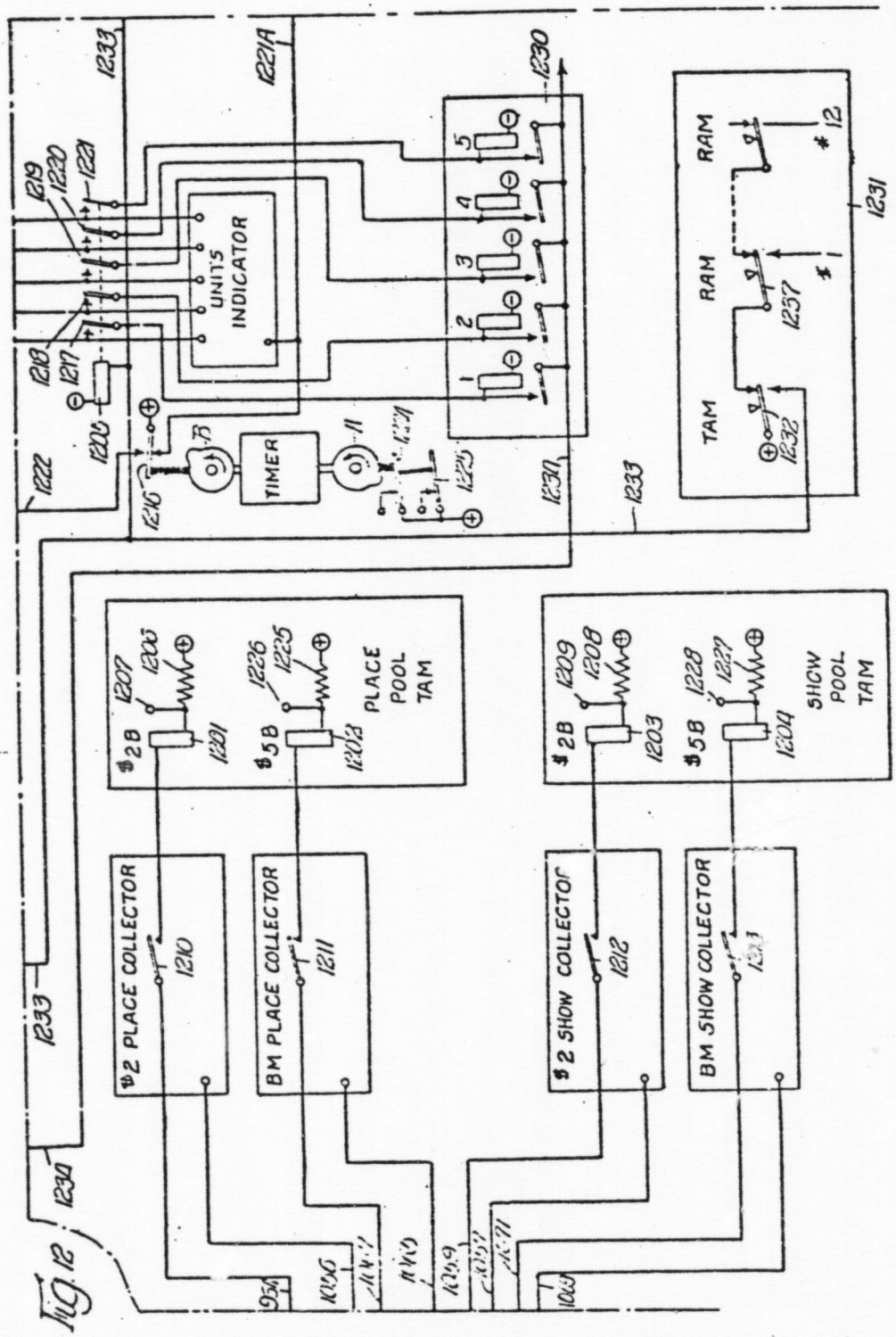


FIG. 12

Fig 13

Fig. 15

IND	CODE	
DIGIT	RLY	RLY
1	1	5
2	3	5
3	2	3
4	1	2
5	2	5
6	1	4
7	1	3
8	4	5
9	2	4
0	3	4

Fig. 16

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

A335

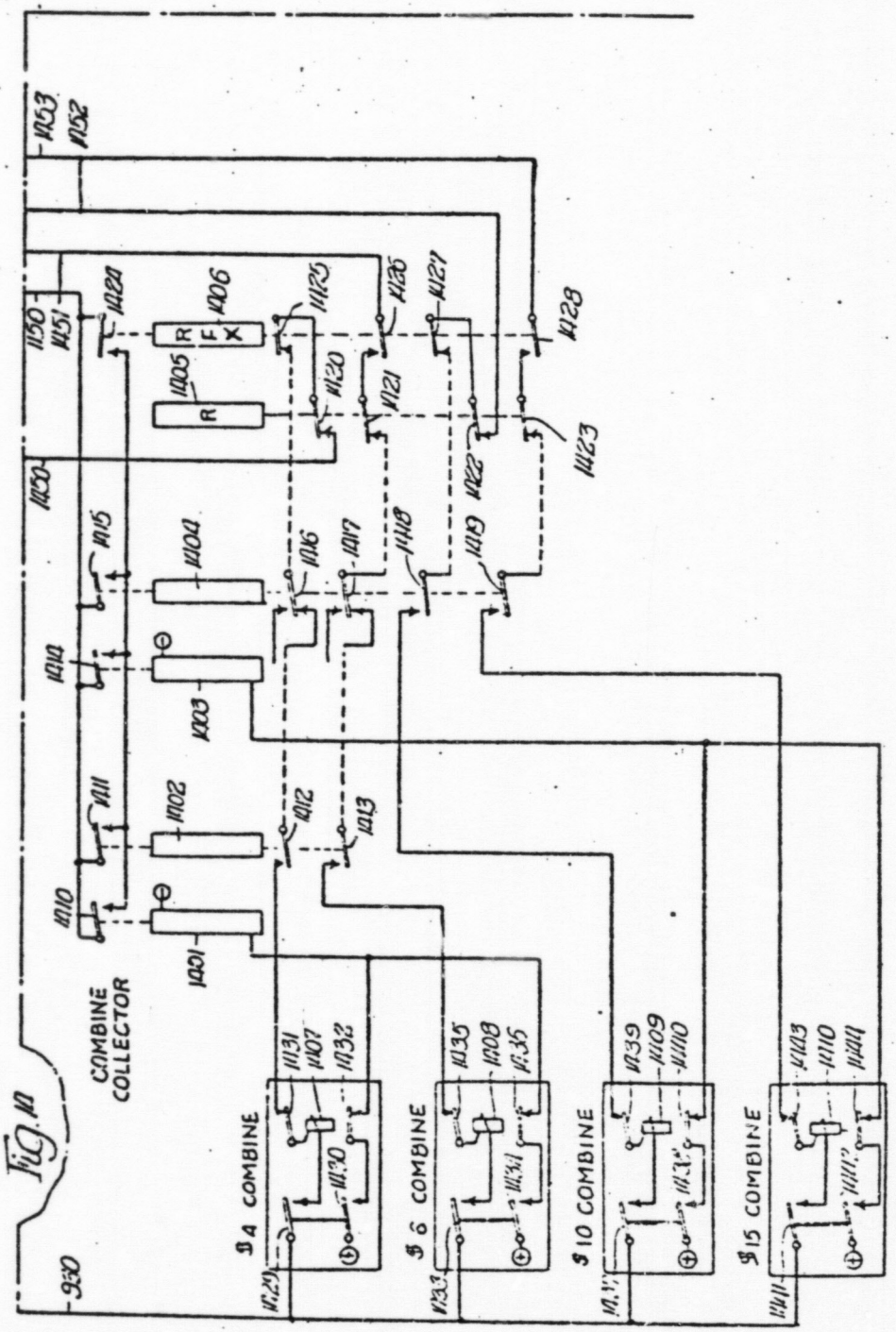

COMBINE COLLECTOR
$4 COMBINE
$6 COMBINE
$10 COMBINE
$15 COMBINE
R
F
X

Fig. 10

United States Patent Office

3,051,384

Patented Aug. 28, 1962

3,051,384

TOTALISATOR SYSTEM

Le Roy J. Lange, Towson, Md., assignor to American Totalisator Company, Division of Universal Controls, Inc., Towson, Md., a corporation of Maryland

Filed Oct. 9, 1959, Ser. No. 845,395
17 Claims. (Cl. 235—92)

This invention relates to totalisator systems and has for its principal object the provision of a new and improved system of this kind.

It is a main object of the invention to provide a totalisator system for use in installations where the required number of ticket machines can be handled on two channels without undue delay.

Another object of the invention is to provide a totalisator system in which a total adding machine is used in conjunction with an individual runner adding machine for the maximum number of runners that can be entered in a race at the track, and in which the individual runner adding machines contain a minimum of control components which are controlled through the total adding machine.

Another object of the invention is to provide a two-channel totalisator system in which two-dollar ticket sales are accepted over one channel, and five, ten, fifty and one hundred dollar ticket sales are accepted over the other channel.

Another object of the invention is to provide a two-channel totalisator system in which each channel is equipped with a direct acting collector through the operation of which the total adding machine may be connected to a ticket machine in each of two groups simultaneously.

Another object of the invention is to provide a two-channel totalisator system in which interference between the channels is prevented by means located in the total adding machine.

Another object of the invention is to provide a totalisator system in which values are registered in the adding machines on stepping switches, and in which those values are displayed on indicators controlled directly through the wipers and contact banks of the switches.

Another object of the invention is to provide in a totalisator system adding machines having a fifty-dollar stepping switch that is operated two steps to register a one hundred dollar transaction.

Further objects of the invention, not specifically mentioned here, will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

FIG. 1 is a block diagram showing the invention;

FIG. 2 is a schematic diagram of an individual runner adding machine;

FIG. 3 is a schematic diagram of a $2.00 collector unit;

FIGS. 4, 5, 7 and 8 contain a schematic diagram of the total adding machine;

FIG. 6 is a schematic diagram of a big money or BM collector unit;

FIGS. 9, 10, 11 and 12 contain a schematic and block diagram of the combine unit;

FIG. 13 is a block diagram of the indicator system with a schematic diagram of the tens digit indicator;

FIG. 14 is a schematic diagram of the combine collector and ticket machines;

FIG. 15 is an indicator code chart;

FIG. 16 is an indicator lamp position chart; and

FIG. 17 is a diagram illustrating the manner in which the various figures of the drawing are to be coupled together.

The totalisator system of the present invention is a two-channel system designed for use at tracks where a limited number of ticket issuing machines will suffice and where the sale of tickets can be handled by two channels without undue delay. The ticket machines, referred to as TIM's, are each arranged to issue $2.00, $5.00, $10.00, $50.00 or $100.00 tickets, to be registered in one of three pools, and in addition combine TIM's are employed to issue tickets to be registered in two or more pools.

In most instances sale of $2.00 tickets requires more TIM's than does the sale of the higher value tickets. Accordingly the $2.00 TIM's in the group are connected to the total adding machine or TAM, one at a time, by a collector that is individual to that group. Preferably this collector is a direct acting all relay collector of the type shown in Patent 2,179,698, issued to Levy on November 14, 1939, modified by the addition of a reflex chain which doubles the number of TIM's that can be connected by the collector. In one instance, a 32-circuit collector is used in connection with 64 TIM's, 32 of which are connected through a main chain and 32 through a reflex chain. Included in these 64 TIM's are the $4.00 combine TIM's arranged to issue tickets registered in the win and show pools, and the $6.00 combine TIM's arranged to issue tickets registered in the win, place and show pools.

The higher value or so-called "big money" or BM TIM's that is, the $5.00, $10.00, $50.00 and $100.00 TIM's, are connected to the TAM, one at a time, by a second or BM collector which is identical with the $2.00 collector and is capable of handling a required number of 64 TIM's, half of which are on the main chain and half on the reflex chain. Included in these BM TIM's are the $10.00 combine TIM's arranged to issue tickets to be registered in the win and place pools, and the $15.00 combine TIM's arranged to issue tickets to be registered in the win, place and show pools.

The TIM's used are of the type shown in the Black Patents 1,886,626 and 1,886,627, issued November 8, 1932. Sufficient to note here that in American practice each TIM contains 12 keys, operable one at a time to select one of 12 runners. While American practice limits the number of runners that can be entered in a race to 12, in other countries a larger number of entries is permitted and the TIM's used are equipped with a key for each runner and there is a RAM for each key.

An operated key in the TIM is locked in operated position throughout the cycle of operation of the machine that prints and issues the ticket. An operation of any one of the keys closes a start circuit. An acceptance relay in the TIM is operated upon completion of the registration of the ticket in the TAM and the selected runner adding machine or RAM. Operation of the acceptance relay initiates the cycle of operation of the TIM to print and issue the ticket, at the end of which cycle the TIM is restored to normal in readiness for the next operation.

The TAM in each pool, in addition to the B relays, contains a slave relay for each B relay, a $5.00 register switch 5R, a $2.00 register switch 2R, a $10.00 register switch 10R, a $50.00 register switch 50R, a $1,000.00 register switch THR, and a $10,000.00 register switch TTHR through which $10,000.00 and $100,000.00 registrations are controlled. These switches, six in number, are all of well known type, each having a motor magnet and a plurality of wipers that are advanced one step upon each deenergization of the motor magnet. Switches 5R, 2R, 10R and THR have banks of 10 contacts for each wiper, and switches 50R and TTHR have banks of 20 contacts for each wiper.

It will be noted that there is no $100.00 register switch in the TAM and RAM's; rather control relays are provided to step the switch 50R two steps to register a

$100.00 transaction. The TAM is also provided with transfer relays, and alarm, indication and reset relays, as will presently appear.

Indicator boards by which the amounts of money in each pool and on each runner in the pool are displayed, may be employed in this system. Control of these indicators is effected directly through the banks of the various register switches. In some instances, the indicator boards are arranged to display only probable odds, and the system is adapted to transfer values registered in the various switches to miniature indicators in the computing room one at a time and in sequence to facilitate computation and display of the probable odds.

Since there are 12 or more RAM's associated with each TAM, simplification of the RAM's by locating as many of the control components as possible in the TAM results in savings in the cost of building, transporting and maintaining the equipment. To this end, each RAM is equipped with but two B relays, namely a 2B and a BMB relay. All big money bets are registered in the RAM through the BMB relay and a slave relay that corresponds to the value of the ticket being registered. Each RAM is equipped with register switches that duplicate those in the TAM.

Referring now to FIG. 1, it will be seen that the win TAM contains 5 bet accepting relays designated as 2B, 5B, 10B, 50B and 100B.

The 2B relay is connected through the $2.00 collector to a $2.00 TIM and the connection extended through an operated key therein to the 2B relay of the selected RAM. Then thus connected 2B relays are operated and circuits originating in the TAM extend over the control paths to the RAM to effect registration of a $2.00 transaction in both machines. These control paths by-pass the collector.

The 5B relay of the TAM is connected through the BM collector to a $5.00 TIM and a circuit extended through an operated key therein to the big money betting relay BMB of the selected RAM. The TAM extends circuits over the control paths to cause registration of a $5.00 transaction in both machines.

In a similar manner, the 10B relay is connected through the BM collector and a $10.00 TIM to the BMB relay of the selected RAM to effect registration of a $10.00 transaction in both machines; and the $50.00 and $100.00 B relays of the TAM are connected through this same collector and the $50.00 and $100.00 TIM's respectively to the BMB relay of the selected RAM to register $50.00 and $100.00 registrations respectively in both machines.

The place pools and show pools duplicate the win pool, and a $4.00 combination TIM is connected through a combine collector to a combine unit, from which a circuit is extended through the $2.00 collector to the 2B relay of the win TAM, a circuit is extended through the $2.00 place collector to the 2B relay of place TAM, a circuit is extended from the combine unit to the 2B relay of the selected RAM in the win pool and also to the 2B relay of a selected RAM in the place pool. The place TAM controls the place RAM over a control path that by-passes the collector, and registration of the $4.00 combine ticket is thus effected in both pools.

The $6.00 combine TIM is connected by the combine collector to the combine unit, and the above two circuits are extended by that unit. In addition, the combine unit extends a circuit through the $2.00 show collector to the 2B relay of the show TAM and to the 2B relay of the show RAM corresponding to the selector selected runner. Control paths are extended as before, and registration of the combine ticket is effected in all three pools.

In a similar manner, a $10.00 combine TIM is connected by the combine collector to the combine unit and circuits extended therefrom to the 5B relay in the win TAM and the BMB relay in the selected win RAM, and to the 5B relay in the place TAM and BMB relay in the selected place RAM, these connections being extended through the win and place BM collectors.

The $15.00 combine TIM is connected by the combine collector to the combine unit and the above circuits to the 5B relays of the win and place TAM extended as before, and in addition the circuit is extended through the BM show collector to the 5BM relay of the show TAM and to the BMB relay of the selected show RAM, and registration of the combine ticket is thus registered in all three pools.

Registering a $2.00 Bet on Runner Number One in the Win Pool

Assuming that all of the equipment is in the normal position in which it is shown in the drawings, and assuming further that the first ticket to be sold is a $2.00 ticket on runner number one in the win pool, key 368 of a $2.00 TIM will be operated and locked in operated position. Operation of key 368 operates spring 369 into engagement with its make contact and a circuit may now be traced through positive through spring 369 and its make contact, spring 371 and its break contact, through the winding of collector start relay 301 to negative. Collector start relay 301 operates over this circuit and at spring 320 and its make contact closes a circuit which may be traced from positive on spring 1224 and its break contact, spring 420 and its break contact, conductor 375, spring 329 and its make contact, conductor 376A, spring 346 and its break contact, spring 350 and its break contact, spring 360 and its break contact, spring 353 and its break contact, thence through the chain of contacts extending through springs 341, 332 and intervening break contacts to spring 321, through spring 321 and its make contact, through the winding of collector relay 302 to negative. Relay 302 operates over this circuit and at spring 325 and its make contact closes a holding circuit for itself that extends over the holding chain through spring 335 and its break contact, spring 343 and its break contact, spring 356 and its break contact, to positive. At spring 323, relay 302 opens the previously traced circuit to spring 321 over which it was initially operated, and extends the circuit through spring 324 and its make contact, spring 330 and its break contact, spring 339 and its break contact, through the winding of reset relay 309 to negative. Relay 302 at spring 327 and its make contact closes a circuit which may be traced from the 2B relay 207 of the number one RAM, conductor 250, through key 368 and its make contact, through the winding of the TIM acceptance relay 314, through spring 370 and its break contact, spring 327 and its make contact, spring 336 and its break contact, spring 344 and its break contact, spring 359 and its break contact, spring 357 and its break contact, conductor 376, through the winding of the 2B relay 401 of the TAM, through resistance 476 to positive. Relays 401 and 207, being low inductance and hence high speed relays, operate over this circuit; however, relay 314 does not receive sufficient current to operate it in view of the inclusion of resistance 476 in the circuit. Relay 401, upon operating, moves spring 420 out of engagement with its break contact, thereby opening the circuit previously traced to 309 to prevent that relay from operating. Relay 309 has higher inductance at relay 401 and consequently does not operate before its circuit is opened.

Operation of relay 401, upon moving spring 420A into engagement with its make contact, closes a circuit from positive therethrough to conductor 480, through the winding of motor magnet 702 of the switch 2R, to negative, operating that magnet preparatory to advancing the wipers of the switch as the magnet is de-energized.

Operation of relay 401 at spring 421 closes a circuit which may be traced from positive at spring 477 and its break contact, conductor 482, spring 477 and its break contact, through spring 421 and its make contact, through the winding of $2.00 slave relay 406 to negative, operating that relay which, at spring 433 and its make contact, closes the obvious holding circuit for itself.

Operation of relay 207 closes a circuit which may be

BEST COPY AVAILABLE

traced from positive, spring 478 and its break contact, conductor 481, through spring 220 and its break contact, spring 248 and its make contact, through the winding of $2.00 slave relay 205 to negative, operating that relay.

Operation of relay 207, at spring 249 and its make contact, closes a circuit from positive, through the winding of the motor magnet 213 of the switch 2R in the selected RAM preparatory to advancing the wipers of that switch as the magnet de-energizes. Operation of magnet 213 moves spring 240 into engagement with its make contact.

The $2.00 acknowledging circuit may now be traced from positive at spring 240 and its make contact, spring 243 and its make contact, conductor 251, through spring 459 closed against its make contact by the operation of magnet 702, spring 432 closed against its make contact by the operation of relay 406, to the junction of the winding of relay 401 and resistance 476, thus short-circuiting resistance 476.

Elimination of resistance 476 from the circuit through acceptance relay 314 of the TIM operates that relay which is held in operated position by a holding circuit in the TIM, not shown. Operation of relay 314 at spring 370 opens the above circuit over which relays 207 and 401 were operated, causing those relays to restore. At spring 371, relay 314 opens the circuit over which start relay 301 was operated, causing that relay to restore. Relay 314, upon operating, initiates a cycle of operation by which a ticket is printed and issued, and at the end of that cycle key 368 and relay 314 are restored to normal.

Restoration of relay 207 opens the previously traced circuit of the magnet 213, causing that magnet to restore and thereby advance the wipers of the RAM switch 2R one step. Restoration of relay 401 opens the previously traced circuit of the motor magnet 702, causing that magnet to restore and thereby advance the wipers of the TAM switch 2R one step. Restoration of relay 207 at spring 248 opens the circuit over which relay 205 was operated, causing that relay to restore. Restoration of relay 401 opens spring 421 thereby opening the circuit over which relay 406 was operated, causing that relay to restore. The TAM and RAM are thus restored back to normal and in readiness for the next operation.

Collector Operations

Restoration of relay 301 did not effect restoration of relay 302 since that relay is held up over the locking chain previously traced to positive on spring 356 and its break contact. Restoration of relay 401 re-applied positive to the chain circuit previously traced, through spring 324 and its make contact, through the winding of relay 309 to negative. This circuit is maintained long enough to permit relay 309 to operate and close a holding circuit for itself, traceable from positive on spring 361 and its break contact, spring 354 and its make contact, through the winding of the relay to negative. Operation of relay 309 opens spring 356 from its break contact, thereby opening the chain circuit over which relay 302 was held operated, causing that relay to restore. Spring 356, moving into engagement with its make contact, closes a circuit from positive, through the winding of a second reset relay 311 to negative, causing that relay to operate and close a holding circuit for itself traceable from positive through spring 361 and its make contact. At spring 355, relay 309 closes a circuit from positive through that spring and its make contact, spring 351 and its break contact, through the lower winding of relay 307 to negative, operating that relay which at spring 348 and its make contact extends a circuit from positive through the lower winding of relay 308 and through the lower winding of relay 307 to negative. Positive thus being applied to both terminals of lower winding of relay 308 prevents that relay from operating at the moment. At spring 349, relay 307 extends a circuit from positive through the winding of reflex relay 310 to negative, operating that relay which at spring 359 disconnects the main chain from spring 357 and connects the reflex chain thereto.

Operation of relay 311 at spring 361 opens the holding circuit of relay 309, causing that relay to restore, whereupon at spring 355 positive is removed from the circuit over which relay 307 was operated, thereby removing positive from the spring 348. Relay 308 now operates in series with the lower winding of relay 307 and thus maintains relay 307 operated.

Restoration of relay 309 re-engages spring 356 with its break contact, re-establishing the holding chain which is now extended through spring 326 and its break contact, conductor 377, spring 362 and its make contact, through the lower winding of relay 311 to negative. Both windings of relay 311 now being energized, the relay restores since those windings oppose each other, as indicated by the arrows.

If at the moment there is no ticket machine on the reflex chain having an operated key, and such is assumed, the circuit previously traced from positive on spring 420 and its break contact, to conductor 375, upon restoration of relay 311, will be extended through spring 358 and its make contact, springs 346 and 350 and their respective make contacts, spring 360 and its break contact, spring 353 and its break contact, thence over the previously traced chain to spring 321 and through the break contact of that spring and thence over the previously traced circuit to relay 309 to negative. Since no ticket machine contains an operated key, this circuit will be maintained long enough to permit relay 309 to operate a second time.

Upon operating relay 309 closes its holding circuit to positive on spring 361 as before, and at spring 353 opens the circuit over which it was operated. Positive on spring 355 is now extended through the make contact thereof, thence over parallel paths the first through spring 352 and its make contact, through the upper winding of relay 308 to negative. Relay 308 is maintained operated over this circuit since its two windings aid each other. The second branch from spring 355 extends through spring 351 and its make contact, spring 347 and its make contact, through the upper winding of relay 307 to negative. Both windings of relay 307 now being energized, the relay restores since those windings oppose each other, as indicated by the arrows. Restoration of relay 307 opens the circuit of relay 310, which restores.

Operation of relay 309 closes the circuit of relay 311, as before, and at spring 361 the holding circuit of relay 309 is opened and that relay restores. Restoration of relay 309 opens the circuit through the upper winding of relay 308 and that relay restores. Restoration of relay 309 re-applies positive to the holding chain, and since under the assumed conditions all collector relays are at normal, that chain extends from conductor 377 over the previously traced circuit through the lower winding of relay 311 to restore that relay. The collector is thus restored to normal and the positive placed on conductor 375 is not extended to conductor 376A until the operation of a key in a $2.00 TIM operates an associated start relay.

Simultaneous Operation of Key in TIM's on Main and Reflex Chains

Assuming now that a key selecting runner number one is depressed in a $2.00 TIM on the main collector chain and that simultaneously therewith or before the thus selected ticket has been issued, a key is depressed to select runner number one in a $2.00 TIM on the reflex chain. Assume, further, that both operated TIM's are the first in their respective groups.

Operation of key 368 in the number one TIM of the main chain operates relay 301 as before, and the registration and issuance of the ticket is the same as before, however, when relay 314 operates and opens spring 371 from its break contact, relay 301 is not de-energized

since operation of key 372 in the first reflex TIM closes a circuit from positive, through spring 373 and its make contact, spring 374-A and its break contact, to maintain relay 301 operated.

The collector operates as before to restore collector relay 302 and to operate reflex relay 310. Positive is thus placed on conductor 376-A through spring 320 and its make contact, and also through spring 358 and its make contact, whereupon relay 302 is again operated and the previously traced circuit from negative through relay 207 and conductor 250 is now extended through key 372 and its make contact, acceptance relay 315, through spring 374 and its break contact, through spring 328 and its make contact, through springs 337 and 345 and their respective break contacts, spring 359 and its make contact, spring 357 and its break contact, conductor 376, thence through the winding of relay 401 through resistance 476 to positive. The relays 207 and 401 operate as before and registration of the $2.00 sale is effected in both the TAM and the RAM; and upon completion of the previously described acknowledging circuit, relay 315 is operated to initiate a cycle of the TIM through which the ticket is printed and issued.

The registration having thus been completed, the collector starts searching for other operated TIM's and finding none restores to normal as before.

Registering a $5.00 Bet on Runner Number One in the Win Pool

Assume now that key 620 in a $5.00 TIM is operated to initiate the sale of a $5.00 ticket on runner number one to win. A circuit is thus closed from positive through spring 621 and its make contact, spring 623 and its break contact, through the winding of relay 601 to negative. The TAM now being at normal, a circuit may be traced from positive on spring 1225 and its break contact, through spring 438 and its break contact, spring 429 and its break contact, spring 426 and its break contact, spring 423 and its break contact, conductor 483 to the start chain of the BM collector shown in FIG. 6.

It will be understood that this collector contains the start chain and holding chain the same as the $2.00 collector, and that the operating circuits have been omitted from FIG. 6 to avoid an unnecessary complication of the drawing.

The positive on conductor 483 is extended to collector relay 602 and thence to negative, operating that relay which closes a holding circuit for itself in the same manner as described in connection with relay 302.

A circuit may now be traced from negative through the BMB relay 206 in the RAM, conductor 257, through key 620 and its make contact, through the winding of TIM acceptance relay 613, spring 622 and its break contact, spring 636 and its make contact, thence through the chain of contacts extending through springs 637, 638, 640, 642 and 648, and their respective break contacts, spring 644 and its break contact, conductor 660, through the winding of SB relay 402 in the TAM, conductor 484, through resistance 485, to positive. Relays 206 and 402, being low inductance hence high speed relays, operate over this circuit, but the inclusion of resistance 485 therein prevents relay 613 from operating at the moment.

Operation of relay 402 at spring 423 removes positive from conductor 483 thereby to stop the BM collector. At spring 424, relay 402 closes a circuit from positive through diode 486, through the winding of $5.00 slave relay 407, conductor 487, spring 460 and its break contact, spring 464 and its break contact, spring 470 and its break contact, conductor 540, through spring 541 and its break contact, through resistance 541 to negative. Relay 407 operates over this circuit.

Operation of relay 407 closes a circuit from positive through spring 445 and its make contact, conductor 720, through the winding of motor magnet 701 of switch 5R to negative, operating that magnet preparatory to advancing the wipers of the switch one step.

Operation of relay 402 also closes a circuit from positive, through spring 424 and its make contact, diode 488, conductor 379, spring 244 and its make contact, through the winding of the $5.00 slave relay 204 in the RAM number one, conductor 252, through springs 223 and 224 and their respective break contacts, spring 221 and its break contact, conductor 253, spring 234 and its break contact, conductor 254, through resistance 255 to negative. Relay 204 operates over this circuit.

Operation of relay 204 closes a circuit from positive through spring 239 and its make contact, through the winding of motor magnet 214 of switch 5R to negative, operating that magnet preparatory to advancing the wipers of the switch one step.

The BM acknowledgment circuit may now be traced from positive on spring 247 and its make contact, spring 238 and its make contact, conductor 256, spring 440 and its make contact, spring 447 and its make contact, to the junction of the winding of relay 402 and resistance 485, thereby to apply positive to both ends of this resistance to short it out and thereby increase the current flowing through relay 613 of the TIM sufficiently to cause an operation of that relay.

Operation of relay 613 at springs 622 opens the circuit over which relays 402 and 206 were operated, restoring those relays. Restoration of relay 402 opens spring 424 from its make contact, thereby opening the circuit over which the $5.00 slave relay 407 in the TAM and the $5.00 slave relay 204 in the RAM were were operated, to permit those relays to restore. Restoration of these slave relays opens the previously described circuits over which the motor magnet 701 of TAM switch 5R and the motor magnet 214 of RAM switch 5R were operated, thereby permitting those magnets to restore and advance the wipers of their respective switches one step.

It will be noted that the previously traced circuit for relay 407 is extended through break contacts 460 and 464 on the transfer relays 411 and 412, also through a break contact 470 on the indication slave relay 414 and through break contact 511 on the magnet 501 of switch 10R to negative, through resistance 541. Although in the operation just described it is not necessary to do so, it will be noted that upon operating, relay 407 closes a circuit through spring 441 and its make contact, which circuit extends over conductor 542 to negative, through resistance 541, thereby to maintain 407 operated even though operation of the magnet 701 of switch 5R necessitates a transfer to switch 10R, as will presently appear.

It will also be noted that negative is applied to the $5.00 slave in the RAM through a similar chain of break contacts and through resistance 255, and that upon operating relay 204 closes a substitute circuit through spring 236 and its make contact, leading directly to negative through the resistance 255 so as to maintain the relay operated even though a transfer be involved.

Operation of acceptance relay 613 in the TIM at spring 623 opens the circuit over which start relay 601 was operated, and assuming that there are no other TIM's in readiness to register a ticket sale, the BM collector cycles itself to search for waiting TIM's on both its main and reflext chains, and finding none returns to normal, in the manner explained in connection with the $2.00 collector.

Registering a $10.00 Bet on Runner Number One in the Win Pool

In order to register a $10.00 bet on runner number one in the win pool, key 624 of a $10.00 TIM is depressed and locked in operated position. A circuit may now be traced from positive through spring 625 and its make contact, spring 627 and its break contact, through the winding of collector start relay 605 to negative, operating that relay. The TAM now being at normal, the previously

traced circuit placing positive on conductor 483 is extended by the operation of start relay 605 to operate collector relay 606. Since the $10.00 TIM is shown to be on the reflex chain of the collector, reflex relay 612 also will be operated in the manner previously explained in connection with reflex relay 310 of the $2.00 collector.

The previously traced circuit from negative through relay 206 and conductor 257 is now extended through spring 624 and its make contact, the winding of acceptance relay 614, spring 626 and its break contact, spring 639 and its make contact, spring 645 and its break contact, spring 649 and its make contact, conductor 661, through the 10B relay 403 of the TAM, conductor 484, through resistance 485 to positive. Relays 206 and 403 operate over this circuit and the inclusion of resistance 485 therein prevents sufficient flow of current to operate acceptance relay 614.

Operation of relay 403 opens springs 426, thereby to remove positive from conductor 483 to stop the BM collector, and at spring 427 relay 403 closes a circuit from positive through diode 469, through the winding of $10.00 slave relay 408, thence over the previously traced circuit through resistance 541 to negative. Relay 408 operates over this circuit and at spring 449 and its make contact closes a holding circuit for itself, previously traced over conductor 542 to negative through resistance 541.

Relay 408, upon operating, closes a circuit from positive through spring 450 and its make contact, conductor 543, through the winding of the motor-magnet 501 of switch 10R to negative, operating that magnet.

Operation of spring 427 against its make contact also closes a circuit through diode 470, conductor 380, through spring 245 and its make contact, through the winding of RAM $10.00 slave relay 203, and thence over the previously traced circuit to negative through resistance 255. Relay 203 operates over this circuit and at spring 230 and its make contact closes a holding circuit for itself over the previously traced circuit to negative through resistance 255. Relay 203 at spring 233 and its make contact closes a circuit from positive, through the winding of the magnet 212 of switch 10R to negative, operating that magnet.

The BM acknowledging circuit may now be traced from positive through spring 235 and its make contact, spring 252 and its make contact, conductor 256, spring 448 closed against its make contact by the operation of relay 408, conductor 543, spring 510 closed against its make contact by the operation of magnet 501, conductor 484, to the junction of resistance 485 and the winding of relay 403 to short-circuit resistance 485 and thereby increase the current flowing through relay 614 sufficiently to cause that relay to operate and initiate the cycle of the TIM to print and issue the $10.00 ticket.

At spring 626, relay 614 opens the circuit over which relays 206 and 403 were operated, causing those relays to restore and open the circuits of relays 203 and 408 respectively, causing those relays to restore and open the circuits of magnets 212 and 501 respectively, causing those magnets to restore and advance the wipers of their respective switches one step.

Restoration of relay 403 also re-applies positive to conductor 483, causing the BM collector to cycle itself in search of other TIM's that contain operated runner selecting keys and finding none to restore to normal in the manner explained in connection with the $2.00 collector.

Registering a $50.00 Bet on Runner Number One in the Win Pool

Depression of the key in a $50.000 TIM selecting runner number one closes springs 623 and 629 against their respective make contacts and a circuit is thus closed from positive through spring 629 and its make contact, spring 631 and its make contact, through the winding of collector start relay 607 to negative, operating that relay. Operation of relay 607 causes collector relay 608 to be operated. The $50.00 TIM being shown connected through the reflex chain, the BM collector cycles and reflex relay 612 is operated, whereupon the circuit previously traced from negative through relay 206 and conductor 257 is now extended through spring 628 and its make contact, through the winding of acceptance relay 615, spring 630 and its break contact, spring 641 and its make contact, spring 646 and its break contact, spring 650 and its make contact, conductor 662, through the winding of the TAM 50B relay 404 and thence over the previously traced circuit to positive, through resistance 485. Relays 404 and 206 operate over this circuit.

Relay 404 at spring 429 removes positive from conductor 483 to stop the BM collector, and at spring 430 relay 404 closes a circuit from positive through this spring and its make contact, diode 491, through the winding of the $50.00 slave relay 409 to negative over the previously traced circuit through resistance 541. Relay 409 operates, and at spring 455 closes a holding circuit for itself, previously traced over conductor 542 and resistance 541 to negative. Relay 409 closes a circuit from positive through spring 456 and its make contact, conductor 544, through the winding of magnet 502 of switch 50R to negative, operating that magnet.

Relay 404 also closes a circuit from positive, through spring 430 and its make contact, diode 492, conductor 381, spring 246 and its make contact, through the winding of RAM $50.00 slave relay 202, and thence over the previously traced circuit to negative through resistance 255. Relay 202 operates over this circuit and at spring 225 and its make contact closes the previously traced holding circuit for itself through resistance 255. At spring 227 and its make contact, relay 202 closes a circuit from positive through the winding of magnet 211 of switch 50R, operating that magnet.

The BM acknowledging circuit may now be traced from positive on spring 229 and its make contact, spring 228 and its make contact, conductor 256, spring 454 and its make contact, conductor 545, spring 514 and its make contact, spring 513 and its break contact, conductor 484, to resistance 485, thereby short-circuiting resistance 485 to increase the current flowing through relay 615, causing that relay to operate.

Operation of relay 615 at contact 630 opens the previously traced circuit through relays 206 and 404, causing those relays to restore, thereby opening the circuits of the slave relays 202 and 409, causing those relays to restore and open the circuits of magnets 211 and 502 respectively, to return the equipment to normal. Restoration of relay 404 reapplies positive to conductor 483, causing the BM collector to cycle in search of other ticket machines having depressed keys and finding none to return to normal.

Registering a $100.00 Bet on Runner Number One in the Win Pool

Operation of a runner number one selecting key in a $100.00 TIM closes spring 633 against its make contact, thereby extending a circuit from positive through spring 635 and its break contact, through the winding of collector start relay 609 to negative, operating that relay which extends the positive on conductor 483 to operate collector relay 610, and since the $100.00 TIM's are on the reflex chain, reflex relay 612 will likewise be operated.

The circuit previously traced from negative through relay 206 and conductor 257 is now extended through spring 652 and its make contact, through the acceptance relay 616 of the TIM, spring 634 and its break contact, spring 643 and its make contact, spring 651 and its make contact, conductor 663, through the winding of the $100.00 B relay 405 of the TAM, through resistance 485 to positive. Relays 405 and 206 operate over this circuit but relay 616 does not at the moment.

Operation of relay 405 at spring 437 closes a circuit from positive over conductor 547 through $100.00 slave relay 505 to negative, operating that relay.

BEST COPY AVAILABLE

Operation of relay 505 closes a circuit from positive through spring 525 and its break contact, spring 519 and its make contact, conductor 548, through diode 491, through the winding of the $50.00 slave relay 409 to negative, over the previously traced circuit, through resistance 541, operating relay 409.

This circuit also extends over the previously traced circuit through diode 492, conductor 381, spring 246 and its make contact, through the winding of the RAM $50.00 slave relay 202, thence over the previously traced circuit to negative through resistance 255. Relay 202 operates over this circuit.

Operation of relay 409 closes a circuit from positive, through spring 456 and its make contact, conductor 544, through the winding of magnet 502 of switch 50R to negative, operating that magnet.

Operation of relay 202 closes the previously traced circuit to the motor magnet 211 of the switch 50R which operates as before. The BM acknowledging circuit may now be traced from positive through spring 229 and its make contact, spring 228 and its make contact, conductor 256, through spring 454 and its make contact, conductor 545, through spring 514 and its make contact, spring 518 and its make contact, spring 520 and its break contact, through the winding of relay 507, operating that relay. At spring 525, relay 507 opens the previously traced circuit over which relay 409 in the TAM and relay 202 in the RAM were operated, causing those relays to restore and thereby opening the circuit of magnet 502 in the TAM and 211 in the RAM, causing those magnets to restore and advance the wipers of their respective switches one step.

Relay 507 closes spring 523 against its make contact, and the circuit from positive through conductor 547 to relay 505 is now extended through relay 506, spring 523 and its make contact, through the winding of relay 507 to negative. Relay 506 operates over this circuit in series with relay 507.

A circuit may now be traced from positive through spring 524 and its make contact, spring 521 and its make contact, spring 519 and its make contact, and thence over conductor 548 and the previously traced circuits to relays 409 and 202, operating those relays, causing them to close the circuit to the motor magnets 502 and 211 as before.

Positive being replaced on the conductor 256, as explained above, now extends through spring 518 and its make contact, spring 520 and its make contact, conductor 484, to the junction of resistance 485 and relay 405, shorting out that resistance to increase the flow of current in the circuit through relay 616, causing that relay to operate and initiate a cycle of operation of the TJM to print and issue the ticket. Relay 616 opens the circuits over which relays 405 and 206 were operated, causing those relays to restore, thereby opening the circuits over which relays 505, 506 and 507 were operated, causing those relays to restore, and the circuit over which relay 202 was operated, causing that relay to restore.

Restoration of these latter relays opens the circuit of the magnets 502 and 211 respectively, causing those magnets to restore and advance the wipers of their respective switches one step.

Thus it will be seen that a $100.00 bet is registered in the TAM and RAM by operating switches 50R therein through two steps.

Transfer From the Units Register to the Tens Register

The registration of a $5.00 bet operates switch 5R one step, in the manner hereinbefore explained. Obviously when a second $5.00 transaction is registered, transfer from the units register to the tens register becomes necessary. The registration of the first $5.00 bet will move the wipers of switch 5R operated by magnet 501 into engagement with their respective first bank contacts. When the 5B and the $5.00 slave relay 407 are operated to initiate the registration of a second $5.00 bet, a circuit may be traced from positive through spring 442 and its make contact, the B wiper of switch 5R and the first contact engaged thereby, conductor 493 that is connected to the zero contact in the bank engaged by the B wiper of switch 2R, thence through the B wiper and through the winding of the first transfer relay 411 to negative, operating that relay which closes a holding circuit for itself that may be traced from positive through spring 468 and its break contact, spring 462 and its make contact.

A circuit may now be traced from positive through spring 512 and its break contact, spring 516 and its break contact, conductor 550, spring 457 and its break contact, spring 451 and its break contact, spring 461 and its make contact, through the winding of relay 412 to negative, operating that relay. Relay 412 closes a holding circuit for itself extending through spring 467 and its make contact, conductor 551 to positive, through spring 512 and its break contact.

Relay 412 also closes a second holding circuit for itself, which may be traced from positive on spring 463 and its make contact, spring 469 and its make contact, through its winding to negative. The circuit over which relay 411 was operated will be maintained until relay 407 restores at the completion of the registration, thus insuring that relay 412 will be maintained throughout the registration cycle.

At spring 468, relay 412 opens the above traced holding circuit of relay 411, without effect at the moment. At spring 466, relay 412 closes the circuit from positive through spring 466 and its make contact, conductor 543, through the winding of motor magnet 501 of the switch 10R, operating that magnet preparatory to advancing the wipers of that switch one step as the magnet de-energizes.

Operation of magnet 501 opens springs 512 and the first holding circuit of relay 412 without effect since the relay is maintained operated over the holding circuit extending through spring 463. When relay 407 is restored at the completion of the registration, relays 411, 412, and magnet 501 restore and the transfer is completed.

Thus it will be seen that upon the initiation of the registration of a second $5.00 bet, switch 10R is operated one step, and when the acknowledging circuit is completed as above, switch 5R is operated through a second step to complete the registration.

It will be noted that the odd-numbered contacts, namely, 1, 3, 5, 7 and 9, in the bank engaged by the B wiper of switch 5R, are multiplied together. Thus each time the wiper B engages an odd-numbered contact denoting registration of an odd $5.00 in switch 5R, operation of relay 407 to initiate registration of an additional $5.00 requires transfer, and upon the operation of springs 442 the above transfer circuits are actuated.

It will also be noted that conductor 493 is connected to the first, the fifth, and the sixth, as well as the zero contact in the bank engaged by the B wiper of switch 2R. When this wiper engages the first bank contact, $2.00 is registered in the switch, bringing the total registration in switches 5R and 2R to a value ending in 7, so that when the relay 407 is operated to initiate another $5.00 registration, transfer becomes necessary and the above circuits are actuated. When the B wiper of switch 2R engages the fifth contact, $10.00 is registered in that switch, and with an odd $5.00 registered in switch 5R, transfer is again necessary when relay 407 is operated to initiate another $5.00 registration. When the B wiper engages its sixth bank contact, $12.00 is registered in that switch and transfer again becomes necessary and is effected in the manner explained above.

It will be noted that the even-numbered contacts 2, 4, 6, 8, and 0, in the bank engaged by the B wiper of switch 5R, are multipled together and connected by conductor 494 to the third and eighth contacts in the bank engaged by the B wiper of switch 2R. Thus when this latter wiper engages the third contact denoting registration of $6.00, or engages the eighth contact denoting the registration

of $16.00 in switch 2R, and the wiper of switch 5R engages one of its even-numbered contacts, operation of relay 407 closes the above transfer circuits and the necessary transfer is thus effected.

The C wiper of switch 5R is connected to positive through either one of the two contacts, namely, 434 closed when the $2.00 slave relay 406 is operated, and 443 closed when the $5.00 slave relay 407 is operated. The odd-numbered contacts in the bank engaged by wiper C are multipled together and connected by conductor 495 to the second and seventh contacts in the bank engaged by the B wiper of switch 2R. Engagement of wiper B with its second bank contact denotes the registration of $4.00 in the switch, and the seventh bank contact denotes the registration of $14.00 therein.

With the C wiper of switch 5R engaging one of its odd-numbered contacts, there is registered in that switch a value containing an odd $5.00, such as $5.00, $15.00, $25.00, etc. Thus the total value registered in the two switches has a units digit of 9, and transfer is required upon the next registration, be that a registration of either $2.00 or $5.00. Thus when positive is placed on wiper C under these conditions, the transfer circuit is completed through the B wiper of switch 2R as above, to effect transfer to switch 10R.

It will be noted that the even-numbered contacts in the bank engaged by the wiper C of the switch 5R are multipled together and connected by conductor 496 to the fourth and ninth contacts engaged by the B wiper of switch 2R designating the units digit of the value registered in that switch as 8. Since the even-numbered contacts engaged by the C wiper of switch 5R denote that the value registered in there is an even number of fives, and the units digit of that sum is zero, transfer becomes necessary when the next registration is either a $2.00 registration or a $5.00 registration, and under these circumstances the placing of positive on the C wiper, as above, completes the transfer circuit through the B wiper of switch 2R in the manner previously explained.

It will also be noted that the D wiper of switch 5R will receive positive through spring 435 of the $2.00 slave relay 406 and spring 444 of the $5.00 slave relay 407 when these two relays are operated simultaneously. Under these conditions of double registration, $7.00 are being added to the value registered in the switches 5R and 2R.

It will also be noted that the odd-numbered contacts engaged by the D wiper are multipled together and connected to conductor 496 which, as previously explained, is connected to the fourth and ninth contacts engaged by the B wiper of switch 2R. Thus when relays 406 and 407 are operated simultaneously, as they can be since each is controlled over a different betting channel, transfer to switch 10R is effected through the D wiper of switch 5R and the B wiper of switch 2R.

It will be noted that the even-numbered contacts in the bank engaged by the D wiper of switch 5R are multipled together and connected to conductor 495, and placing of positive on the D wiper will complete the transfer circuit when the B wiper of switch 2R is in engagement with the second or seventh contact in its bank.

Preventing Interference Between a Transfer From the $2.00 Channel During Registration of a Bet Over the BM Channel

It will be noted that the circuit over which transfer relay 412 is operated, upon operation of transfer relay 411, extends through normally closed contacts 451 on the $10.00 slave relay 408, normally closed contacts 457 on the $50.00 slave relay 409, and also through normally closed contacts 516 on switch 50R and normally closed contacts 512 on switch 10R. Thus, should either of these relays or either of these magnets be operated when relay 411 is operated, operation of relay 412 is delayed until the operated relay or magnet restores. Relay 411, upon operating, is maintained operated over the holding circuit through springs 463 until relay 412 is operated. Thus if transfer is initiated by an operation of the $2.00 slave relay 406 and closing of spring 434 against its make contact, the previously traced $2.00 acknowledging circuit may be completed and relay 406 restored before relay 412 operates. The transfer is not lost and relay 412 is operated as soon as its circuit is completed, notwithstanding the restoring of relay 406.

From the foregoing, it is apparent that accumulation of values in the $2.00 register are transferred to the $10.00 register whenever necessary. Obviously, then, if a trouble condition exists in the big money channel, such transfers will be lost if the $2.00 channel is permitted to operate. This loss of transfers is prevented in the following manner.

The 5B relay 402 carries a spring 425 closed against its make contact when the relay operates. A 10B relay 403 has a similar spring 428, similarly closed. The 50B relay 404 likewise carries a similar spring 431 and the 100B relay 405 carries a spring 439. Operation of relay 402, for example, closes a circuit from positive through spring 425 and its make contact through a signal lamp associated with the relay 402 and a diode individual thereto, to a conductor 382 that is common to the lamps and diodes of the other big money relays.

Conductor 382 is connected through resistance 316 and an alarm relay 312 to negative, so that operation of spring 425 causes relay 312 to operate. Operation of relay 312 opens spring 363 from its break contact without effect at the moment. Operation of this relay also closes springs 364 and 365 against their respective make contacts, thereby closing parallel circuits the first of which extends from positive through spring 364 and its make contact, condenser 318, through resistance 319 to negative. The second parallel path extends from positive through spring 365 and its make contact, through the winding of relay 313, through resistance 319 to negative.

Condenser 318 has a capacity of approximately sixty (60) microfarads, and resistance 319 has a value of 1,000 ohms. Relay 313 is a high inductance relay having resistance of 3,400 ohms, and as a result this relay receives insufficient current to permit it to operate during the period that charging current is flowing into the condenser 318. Resistance 319 limits the rate of flow of this charging current, with the result that appreciable time is required before the condenser becomes fully charged. In normal operation, the operated B relay, assumed to be 402, will be restored before condenser 318 becomes fully charged; however, should the BM acknowledging circuit be not completed, for example, by the inclusion of a dirty contact therein, relay 402 will remain operated long enough to permit condenser 318 to become fully charged, at the end of which time relay 313 can receive sufficient current to enable it to operate.

Operation of relay 313 closes a circuit from positive through spring 365 and its make contact, conductor 383, through the winding of alarm cut-out relay 410 to negative, causing that relay to operate. At spring 477, relay 410 opens the previously traced circuit over which slave relay 406 was operated, thereby preventing operation of that relay so long as relay 410 remains operated. At spring 473, relay 410 removes positive from conductor 431, thereby to prevent the operation of slave relay 205 in the RAM. Further operation of the $2.00 channel is thus prevented so long as the trouble remains uncleared in the big money channel, and loss of transfers from the $2.00 register to the $10.00 register is thus prevented.

Upon correction of the trouble and return to normal operation of the big money channel, relay 402 will be restored by the completion of the big money acknowledging circuit under the assumed conditions; whereupon, the circuit of relay 312 will be opened and that relay will restore and open the circuit of relay 313, which likewise restores and opens the circuit of the alarm relay 410, restoring

that relay, thereby to restore the $2.00 channel to operation. Restoration of relay 312 closes spring 363 against its break contact, thereby short-circuiting condenser 318 through resistance 317 to dissipate the charge stored in the condenser, thereby returning it to normal in readiness for the next operation.

In case trouble develops in the $2.00 channel, it is not necessary to halt operation of the BM channel since there will be no transfers into it from the $2.00 channel. It will be noted that the 2B relay 401 in the TAM carries a spring 422 closed against its make contact by an operation of the relay. This extends a circuit from positive through the associated lamp to negative, to light that lamp. Positive is also placed on terminal 422A to which is connected a conductor leading to a $2.00 alarm relay combination similar in function to relays 312 and 313. The $2.00 alarm relays have been omitted from the drawings to avoid an unnecessary complication thereof. Since a $2.00 alarm affects only the $2.00 channel, details thereof are not necessary to a complete understanding of this invention.

Transfer From the Switch 10R to the Switch 50R

Switch 10R is arranged to transfer to switch 50R for each $50.00 registered in switch 10R. This transfer is effected through the A wiper of switch 10R. It will be noted that the fourth contact in the bank engaged by the A wiper, and the ninth contact in this bank, are connected together and to conductor 553. When the A wiper engages contact number four, $40.00 will be registered in the switch, and transfer is necessary upon the next operation of the switch. When the A wiper is in engagement with the ninth contact in its bank, $90.00 will be registered in the switch, and transfer again becomes necessary.

The magnet 501 of switch 10R is operated over a circuit completed either by operation of the $10.00 slave relay 408 and consequent closing of spring 459 against its make contact, or through the operation of transfer relay 412 and consequent closing of its spring 466 against its make contact.

Assume first that with the wiper A engaging the fourth contact in its bank, the $10.00 slave relay 408 is operated to initiate a fifth operation of the switch. A circuit may be traced from positive through wiper A and its fourth bank contact, conductor 553, through spring 453 and its make contact, conductor 497, conductor 544, through the winding of magnet 502 of switch 50R to negative. Magnet 502 operates over this circuit preparatory to advancing its wipers one step and upon restoration of the relay 408, magnet 502 restores and the registration is thus completed.

In the event that the operation of magnet 501 is effected through a transfer, operation of relay 412 closes spring 453A against its make contact, thereby extending the previously traced circuit through conductor 553 to conductor 497, to operate the magnet 502. Transfer of $50.00 from the switch 10R to the switch 50R is thus accomplished.

Transfer From the Switch 50R to the Switch THR

Values are accumulated in the switch 50R without transfer until that switch has taken nineteen steps, at which time $950.00 will be registered therein. At this time, the A wiper of switch 50R will be engaged with its nineteenth contact, and upon the next operation of magnet 502, preparatory to registering an additional $50.00 in switch 50R, transfer becomes necessary. Assume first that magnet 502 is operated by an operation of the $50.00 slave relay 409 to effect this registration. Relay 409 closes spring 456A against its make contact, extending positive over conductor 554 through wiper A of switch 50R and the nineteenth bank contact engaged thereby, through spring 531 and its break contact, spring 533 and its break contact, conductor 555, through the winding of magnet 503 of the switch THR to negative. Magnet 502 is also operated through spring 456 and its make contact as before. Upon restoration of slave relay 409, the circuits of magnets 502 and 503 are opened and those magnets restored to advance their respective wipers one step to complete the transfer.

With wiper A of switch 50R engaging its nineteenth contact, and the wipers of 10R engaging their fourth or ninth contacts, transfer from the switch 10R to the switch 50R, and transfer from the switch 50R to the switch THR, both become necessary. Under these circumstances, magnet 501 of switch 10R may be operated over the previously traced circuit through springs 453 if registration is to be effected by the $10.00 slave relay 408, as before. Operation of relay 408 also closes spring 452A, extending circuit from positive through that spring and its make contact, conductor 556, through the B wiper of the switch 10R and its fourth or ninth contacts, conductor 554, and thence over the previously traced circuit through the A wiper of switch 50R to the magnet 503. Under these circumstances, magnets 501, 502 and 503 are all operated preparatory to advancing their respective wipers one step as the magnets restore.

In the event that switch 10R is to be operated because of a transfer from the switches 5R and 2R, transfer relay 412 will be operated and a circuit will be extended from positive through spring 469A to conductor 556, thence over the previously traced circuit to magnet 503, operating that magnet preparatory to advancing switch THR one step.

The circuit of magnet 503, as well as the circuit of magnet 502 being now completed through the operation of relay 412, an auxiliary holding circuit for relay 412 is brought into play to insure that that relay remains operated until magnets 502 and 503 are fully operated. To this end, the positive on conductor 544 that operates magnet 502 is extended through diode 502A through spring 515 and its break contact to conductor 557, through spring 465 and its make contact, to the winding of relay 412, holding that relay operated until spring 515 opens. In a similar manner, the positive on conductor 555 that operates magnet 503 is extended through diode 503A, through spring 522 and its break contact, to conductor 557 and thence over the just traced circuit to relay 412, this latter circuit being maintained until magnet 503 is fully operated and spring 522 moved out of engagement with its break contact. Thus it will be seen that transfer into switch 10R, into switch 50R, and into switch THR, occurring simultaneously through the operation of relay 412, is completed, even though previously traced holding circuits for relay 412 may have been opened before magnets 502 and 503 have both become fully operated.

Transfer From Switch THR to Switch TTHR

Since each step of switch THR denotes the registration of $1,000.00 in that switch, transfer to the ten thousands switch TTHR is necessary upon every tenth registration in switch THR. This is accomplished through the B wiper of switch THR, and when that wiper is in engagement with the ninth contact in its bank and the A wiper of switch 50R is in engagement with the nineteenth contact of its bank, transfer must occur upon operation of magnet of switch 50R to register another $50.00 therein.

The previously traced circuit from the nineteenth contact of the bank engaged by wiper A of the switch 50R, through spring 531 and its break contact, is extended over conductor 555 through the B wiper of switch THR and its ninth bank contact, through the winding of magnet 504 to negative, operating that magnet preparatory to advancing switch TTHR one step. Should this operation be occasioned by an operation of transfer relay 412 as explained before, the positive extended to magnet 504 is extended through diode 504A, through spring 526 and its break contact, to conductor 557, thereby to insure that

relay 412 will be maintained until the magnets of all the switches involved have been fully operated.

Registering the Sale of Combine Tickets

The system of the present invention is designed to register the issuance of combine tickets of four values. In FIG. 14, there is shown the first of several combine TIM's in each of the four groups. The first of these machines issues $4.00 tickets that designate $2.00 on a runner to win and $2.00 on the same runner to place. The $6.00 ticket machine, in addition to the win and place designation, also designates $2.00 on the same runner to show. The $10.00 combine TIM designates $5.00 on a runner to win and $5.00 on that same runner to place, and the $15.00 combine TIM adds thereto $5.00 on that runner to show.

The combine TIM's are connected through a combine collector to combine unit. This collector, shown in FIG. 14, duplicates the collector shown more completely in FIG. 3, except that a smaller number of pairs of relays are provided since the number of combine TIM's needed is not as great as the number of $2.00 TIM's. The combine collector is equipped with a reflex relay and, as shown, handles the $4.00 and $10.00 TIM's through its main chain, and the $6.00 and $15.00 TIM's through its reflex chain. This specific arrangement may be altered within the teachings of the invention, if desired.

Issuing a $4.00 Combine Ticket on Runner Number One

Runner number one key 1429 in the $4.00 TIM is depressed and locked in operated position, and through this operation spring 1430 is closed against its make contact. A circuit is thus extended from positive through spring 1430 and its make contact, through spring 1432 and its break contact, through the collector start relay 1401 to negative, operating that relay. A circuit may now be traced from positive on spring 1041, conductor 1050, spring 1111 and its break contact, spring 1119 and its break contact, spring 1128 and its break contact, spring 1136 and its break contact, conductor 1150, through spring 1410 and its make contact, to the collector start chain. When its turn is reached, collector relay 1402 will be operated in the manner described in connection with relay 302 of the $2.00 collector. A circuit may now be traced from negative through the number one relay 905 of the combine unit, conductor 930, spring 1429 and its make contact, through the winding of TIM acceptance relay 1407, through spring 1431 and its break contact, spring 1412 and its make contact, spring 1416 and its break contact, thence through similar break contacts on the other collector relays, spring 1425 and its break contact, spring 1420 and its break contact, conductor 1450, through the winding of 4B relay 1101 in the combine unit, conductor 1151, through resistance 1109 to positive. Relays 905 and 1101 operate over this circuit, but the inclusion of resistance 1109 therein prevents sufficient flow of current therein to operate acceptance relay 1407 at the moment.

Operation of relay 1101 closes a circuit from positive, through spring 1110 and its make contact, through the winding of the $4.00 slave relay 1102 to negative, operating that relay. At spring 1111, relay 1101 opens the previously traced circuit of the start chain of the combine collector to stop that collector. Operation of relay 1101 closes a circuit from positive through spring 1112 and its make contact, conductor 1098, through combine slave relay 1007 to negative, operating that relay.

Operation of relay 905 closes a circuit from positive through spring 922 and its make contact, through the winding of runner number one slave relay 906 to negative, operating that relay.

A circuit may now be traced from positive on spring 1011 and its make contact, spring 1019 and its break contact, conductor 1051, spring 1114 and its make contact, conductor 1052, to start relay 303 in the $2.00 win collector to negative, operating that relay. When its turn is reached, collector relay 304 operates in the previously explained manner. A circuit may now be traced from negative through 2B relay 207 in the number one RAM of the win pool, conductor 250, spring 910 and its make contact, conductor 931, through spring 1017 and its break contact, through the $2.00 win acceptance relay 1001 in the combine unit, conductor 1053, spring 1113 and its make contact, conductor 1054, through spring 336 and its make contact, spring 344 and its break contact, spring 359 and its break contact, spring 357 and its break contact, conductor 376, through the winding of the 2B relay 401 in the win TAM, through resistance 476 to positive. Relays 207 and 401 operate over this circuit, but the inclusion of resistance 476 therein prevents acceptance relay 1001 from operating at the moment. Operation of relays 207 and 401 effect registration of the $2.00 in the win TAM and runner number one RAM in the hereinbefore described manner.

Operation of relays 906 and 1101 also closes a circuit which may be traced from positive, spring 1013 and its make contact, spring 1027 and its break contact, conductor 1055, spring 1116 and its make contact, conductor 1056 to the start chain in the $2.00 place collector to a start relay in the place collector associated with the operated $4.00 combine TIM. In FIG. 12, the collector is skeletonized to avoid unnecessary repetition in the drawing. When its turn is reached, the collector relay associated with the operated collector start relay is operated and contact 1210 closed thereby.

A circuit may now be traced from negative through the 2B relay 901 in the RAM number one in the place pool, spring 912 and its make contact, conductor 932, spring 1025 and its break contact, through the upper winding of $2.00 place acceptance relay 1003 of the combine unit, conductor 933, spring 1115 and its make contact, conductor 934, spring 1210 and its make contact, through the winding of the 2B relay 1201 in the place pool TAM, resistance 1206, to positive. Relays 901 and 1201 operate over this circuit, but the inclusion of resistance 1206 therein, prevents operation of relay 1003 at the moment.

In the win pool, when the registration is complete, the acknowledging circuit is extended to short-circuit resistance 476 in the hereinbefore described manner, thereby to increase the current flow in the circuit through relay 1001 sufficiently to cause that relay to operate and close a holding circuit for itself that may be traced from positive through spring 1010 and its make contact and 1018 and its make contact, through the lower winding of the relay to negative. At spring 1017, relay 1001 opens the circuit over which relays 207 and 401 were operated, restoring those relays to complete the registration of $2.00 in the win pool. In the place pool, upon completion of the $2.00 acknowledging circuit which duplicates that of the win pool, positive is applied to terminal 1207, thereby short-circuiting resistance 1206 and increasing the flow of current in the circuit through relay 1003 sufficiently to cause that relay to operate and close a holding circuit for itself which may be traced from positive through spring 1012 and its make contact, spring 1026 and its make contact, through the lower winding of relay 1003 to negative. Operation of relay 1003 at springs 1025 opens the circuit of relays 901 and 1201, causing those relays to restore to complete the registration of $2.00 in the place pool.

Relays 1001 and 1003 now both being operated, the combine acknowledging circuit may now be traced from positive through spring 1117 and its make contact, conductor 1152, through spring 1028 and its make contact, spring 1020 and its make contact, spring 1016 and its make contact, conductor 1151, to the junction of the winding of 1101 and resistance 1109, this thus being applied to both terminals of 1109, so that results that re-

sistance and increases the flow of current through relay 1407 sufficiently to cause that relay to operate and thereby initiate the cycle of the $4.00 combine TIM to print and issue the ticket.

Operation of relay 1407 also opens spring 1431 thereby to open the circuit over which relays 1101 and 905 were operated, causing those relays and their associated slave relays 1102 and 906 respectively, to restore. At spring 1432, relay 1407 opens the circuit of collector start relay 1401 to restore that relay. At the end of the cycle of the TIM, springs 1429 and 1430 are opened in the usual manner to restore the equipment to normal.

Registering the Sale of a $6.00 Combine on Runner Number One

To do this, key 1433 in the $6.00 combine TIM is operated and with it spring 1434 closed against its make contact to extend a circuit from positive through spring 1436 and its break contact to collector start relay 1401. When its turn is reached, collector relay 1402 operates as before and reflex relay 1406 also operates. A circuit may now be traced from negative through relay 905 and over the previously traced circuit to conductor 939, spring 1433 and its make contact, through the winding of acceptance relay 1408 of the $6.00 TIM, spring 1435 and its break contact, spring 1413 and its make contact, spring 1417 and its break contact, thence over the chain to spring 1421 and its break contact, spring 1426 and its make contact, conductor 1451, through the winding of $6.00 B relay 1103 of the combine unit to positive on conductor 1151 through resistance 1109. Relays 905 and 1103 operate over this circuit, relay 905 closing the previously traced circuit for its slave relay 906 and relay 1103 closing a circuit from positive through spring 1118 and its make contact, through the $6.00 slave relay 1104 of the combine unit to negative, operating that relay. At spring 1120 and its make contact, relay 1103 applies positive to conductor 1003 to operate relay 1007 as before. At spring 1119, relay 1103 opens the start circuit of the combine collector to stop that collector as before.

Operation of relay 1104 closes the circuit of start relay 303 in the $2.00 win pool collector as previously traced, except that conductor 1051 is connected to conductor 1052 through spring 1122 instead of spring 1114.

Operation of relays 906 and 1104 close the previously traced circuit through the $2.00 win acceptance relay 1001, except that the connection between conductors 1053 and 1054 is through spring 1121 and its make contact, instead of through spring 1113. Thus the previously described operation of registering $2.00 in the win pool is repeated.

Operation of relay 1104 closes the start circuit of the place collector as previously traced, except that conductor 1055 is connected to conductor 1056 through spring 1124 and its make contact, instead of through spring 1116.

Operation of relays 906 and 1104 also closes the circuit through $2.00 place acceptance relay 1003, as previously traced, except that the connection between conductors 933 and 934 is now extended through spring 1123 and its make contact, instead of spring 1115, and a registration of $2.00 in the place pool is effected as before.

A third circuit may now be traced from positive on spring 1015 and its make contact, through spring 1035 and its break contact, conductor 1056, spring 1126 and its make contact, conductor 1057, to a start relay in the $2.00 show collector associated with the operated TIM, to operate that relay. When its turn is reached, the collector relay associated with that start relay will be operated and springs 1212 closed, and a circuit may now be traced from negative through the 2B relay 903 in the show pool, RAM number one, spring 914 and its make contact, conductor 935, spring 1033 and its break contact, through the upper winding of relay 1005, conductor 1058, spring 1125 and its make contact, conductor 1059, spring 1212 and its make contact, through the winding of 2B relay 1203 of the show pool TAM, resistance 1208, to positive. Relays 903 and 1203 operate over this circuit, but the inclusion of resistance 1203 therein prevents the operation of relay 1005 at the moment. In due course, the $2.00 acknowledging circuit of the show pool will be completed and positive applied to terminal 1209, thereby to short-circuit resistance 1208 and increase the flow of current through relay 1005, causing that relay to operate and close a holding circuit for itself which may be traced from positive through spring 1014 and its make contact, spring 1034 and its make contact, through the lower winding of relay 1005 to negative. Relays 1001, 1003 and 1005 now being operated, the combine acceptance circuit is completed from positive through spring 1036 and its make contact and thence over the previously traced circuit through springs 1028, 1020, and 1016 to conductor 1151, thereby to apply positive to both terminals of resistance 1109 which increases the flow of current through relay 1408 sufficiently to cause that relay to operate and initiate the operation of the cycle of the $6.00 combine TIM. At spring 1435, relay 1408 opens the circuit of 1103 and 905, causing those relays to restore and at springs 1436 open the circuit of relay 1401 to cause that relay to restore and thereby complete the registration of the $6.00 combine with $2.00 in the win pool, $2.00 in the place pool, and $2.00 in the show pool TAM's and $2.00 on the number one RAM's in each of these pools.

Registering a $10.00 Combine Ticket on Runner Number One

Operation of key 1437 in the $10.00 combine TIM to select runner number one, closes a circuit from positive through spring 1438 and its make contact, spring 1440, through the winding of combine collector start relay 1403 to negative, operating that relay. When its turn is reached, collector relay 1404 will operate and a circuit may then be traced from negative through runner number one, relay 905, in the combine unit, over the previously traced circuit, to conductor 930, thence through spring 1437 and its make contact, through the winding of TIM acceptance relay 1409 and its break contact, spring 1439 and its break contact, spring 1418 and its make contact, spring 1427 and its break contact, spring 1422 and its break contact, conductor 1452, through the winding of the 10B relay 1105 in the combine unit to positive placed on conductor 1151, through resistance 1109. Relays 905 and 1105 operate over this circuit. Relay 1105, upon operating at spring 1128 opens the previously traced start circuit of the combine collector to stop that collector. At spring 1129 and its make contact, relay 1105 applies positive to conductor 1008, thereby to operate relay 1007 as before. At spring 1127 and its make contact, relay 1105 closes the circuit of its slave relay 1106, operating that relay.

A circuit may now be traced from positive through spring 1011 and its make contact, spring 1023 and its break contact, conductor 1050, through spring 1131 and its make contact, conductor 1061, through the winding of start relay 603 in the BM collector in the win pool to negative, operating that relay. When its turn is reached, collector relay 604 is operated and a circuit may now be traced from negative through BMB relay 206 in the runner number one RAM in the win pool, conductor 257, through spring 911 and its make contact, conductor 940, spring 1021 and its break contact, through the winding of relay 1002, conductor 1062, spring 1130 and its make contact, conductor 1063, spring 637 and its make contact, thence over the previously traced chain to spring 648 and its break contact, spring 644 and its break contact, through conductor 660, through the winding of the 5B relay 402, conductor 484, resistance 485, to positive. Relays 206 and 402 operate over this circuit, but the inclusion of resistance 485 therein prevents the operation of relay 1002 at the moment.

Operation of relays 206 and 401 initiates a $5.00 registration in the TAM and runner number one RAM in the win pool in the hereinbefore explained manner. Upon completion of the BM acknowledging circuit of

the win pool, resistance 485 is short-circuited as before, and a current flowing through relay 1002 increases sufficiently to cause that relay to operate and close a holding circuit for itself traceable from positive through spring 1010 and its make contact, spring 1022 and its make contact, through the lower winding of relay 1002 to negative. At spring 1021, relay 1002 opens the circuit over which relays 206 and 402 were operated to restore those relays. At spring 1023, relay 1002 opens the previously traced circuit of start relay 603 to restore that relay.

Operation of relay 1106 also closes a circuit which may be traced from positive through spring 1013 and its make contact, spring 1031 and its break contact, conductor 1064, through spring 1133 and its make contact, conductor 1065, to the start relay in the BM place collector associated with the $10.00 combine TIM, to operate that relay. When its turn is reached, the associated collector relay operates and closes spring 1211. A circuit may now be traced from negative through BMB relay 902 in place pool RAM number one, spring 913 and its make contact, conductor 941, spring 1029 and its break contact, through the winding of combine unit $5.00 place acceptance relay 1004, conductor 1066, spring 1132 and its make contact, conductor 1067, spring 1211 and its make contact, through the winding of the 5B relay 1202 in the place TAM, resistance 1225 to positive. Relays 902 and 1202 operate over this circuit, but the inclusion of resistance 1225 prevents the operation of relay 1004 at the moment.

Operation of relays 902 and 1202 effect registration of a $5.00 bet in the place TAM and in the runner number one RAM in the place pool. In due course, the place pool BM acknowledging circuit is closed and positive applied to terminal 1226, thereby to short-circuit resistance 1225 to increase the flow of current through 1004 and operate that relay. Relay 1004 closes a holding circuit for itself which may be traced from positive through spring 1012 and its make contact, spring 1030 and its make contact, through the lower winding of the relay to negative. At spring 1031, relay 1004 opens the previously traced start circuit of the BM place collector to restore that collector, and at spring 1025 opens the circuit of relays 902 and 1202 to restore those relays and thereby complete registration of the value of the place pool.

Relays 1002 and 1004 now being operated, the combine unit acknowledging circuit may be traced from positive through spring 1134 and its make contact, conductor 1065, spring 1032 and its make contact, spring 1024 and its make contact, spring 1016 and its make contact, conductor 1151, to the junction of relay 1105 and resistance 1109, thereby short-circuiting this resistance and increasing the current flowing through acceptance relay 1409 sufficiently to operate that relay. Relay 1409 initiates a cycle of the TIM, and at spring 1439 opens the circuit over which relays 905 and 1105 were operated to restore those relays. At spring 1440, relay 1409 opens the circuit of combine collector start relay 1403 to restore that relay.

Registration of a $15.00 Combine Ticket on Runner Number One

Operation of key 1441 in the $15.00 combine TIM closes a circuit from spring 1442 and its make contact, spring 1444 and its break contact, through the winding of combine collector start relay 1493 to negative, operating that relay. When its turn is reached, collector relay 1494 will be operated and relay 1406 will likewise be operated. A circuit may then be traced from runner number one relay 905, conductor 930, through spring 1441 and its make contact, through the winding of relay 1410, spring 1443 and its break contact, through spring 1419 and its make contact, spring 1423 and its break contact, spring 1428 and its make contact, conductor 1453, through the winding of the 15B relay 1107, conductor 1151 and resistance 1109 to positive. Relays 1107 and 905 operate over this circuit, but the inclusion of resistance 1109 therein prevents the operation of relay 1410 at the moment.

Operation of relay 905 closes the circuit for its slave relay 906, as before. Operation of relay 1107 at spring 1136 opens the previously traced start circuit of the combine collector to stop that collector. At spring 1135, relay 1107 closes the circuit of its slave relay 1108 to negative, operating that relay.

The circuit of relay 603 in the BM collector in the win pool is now closed, as previously traced, except that conductor 1060 is connected to conductor 1061, through spring 1139 and its make contact, instead of springs 1131. The circuit of the BM relay 206 and 5B relay 402 is closed, as previously traced, except that conductor 1062 is connected to conductor 1063, through spring 1138 and its make contact, instead of springs 1130. Registration of $5.00 in the win pool is effected as before.

The start circuit of the BM collector in the place pool is closed as previously traced, except that conductor 1064 is now connected to conductor 1065, through spring 1141 and its make contact, instead of springs 1133.

The circuit of the BMB relay 902 and 5B relay 1202 is closed, as previously traced, except that conductor 1066 is connected to conductor 1067 through spring 1140 and its make contact, instead of springs 1132, and registration of $5.00 in the place pool is effected as before.

A third circuit may now be traced from positive through spring 1015 and its make contact, spring 1039 and its break contact, conductor 1068, through spring 1143 and its make contact, conductor 1069, through the start relay in the BM show collector associated with the $15.00 combine TIM, to negative operating that relay.

In due course, the associated collector relay will operate and close springs 1213. A circuit may now be traced from negative through the BMB relay 904 in the show pool RAM number one, spring 915 and its make contact, conductor 942, spring 1037 and its break contact, through the upper winding of the $5.00 show acceptance relay 1006, conductor 1070, spring 1142 and its make contact, conductor 1071, spring 1213 and its make contact, through the 5B relay 1204 of the show pool TAM and resistance 1227 to positive. Relays 904 and 1204 operate over this circuit, but the inclusion of resistance 1227 therein prevents operation of relay 1006 at the moment.

Registration of $5.00 in the show pool TAM and selected show pool RAM is thus initiated and in due course positive is applied to terminal 1228 to short-circuit resistance 1227 and thereby increase the current flow through relay 1006 sufficiently to cause that relay to operate.

Relay 1006 closes a holding circuit for itself traceable from positive through spring 1014 and its make contact, spring 1038 and its make contact, through the lower winding of the relay to negative, and at spring 1037 opens the circuit of relays 904 and 1204, permitting those relays to restore and at spring 1039 opens the start circuit of the BM show collector, permitting that collector to restore.

Relays 1002, 1004 and 1006 now being operated, the combine acknowledging circuit may be traced from positive through spring 1040 and its make contact, thence over the previously traced circuit through the respective make contacts of springs 1032, 1024 and 1016, to conductor 1151, thereby to apply positive to both terminals of resistance 1109, short-circuiting that resistance to increase the flow of current through relay 1410 sufficiently to cause that relay to operate and initiate a cycle of the $15.00 TIM. At springs 1443 relay 1410 opens the circuit over which relays 905 and 1107 were operated, thereby to restore those relays, and at spring 1444, relay 1410 opens the circuit of BM collector start relay 1403 to permit that

relay to restore and thereby restore the combine unit to normal.

Indication of Dollar Values Registered in the System

The totalisator of the present invention is oftentimes used in connection with indicator boards, usually referred to as "infield boards," upon which are displayed the dollar value of the sum registered in the TAM and the sums registered in the various RAM's in each pool at the moment. Thus the patrons of the track are apprised of the values in the various pools and upon each runner therein. The indicators shown are of known type, consisting of banks of lamps, each bank containing 24 lamps which are lighted in various combinations to indicate a digit. The lamps are controlled by five relays, two of which must be operated to effect an indication. The five relays of each digit are controlled directly from the banks of the corresponding register switch.

At regular intervals, usually 90 seconds, the timer, FIG. 12, operates to erase the indication then showing and to reset the indicators to indicate the values then registered in the TAM and RAM's.

As shown, the timer rotates cams A and B in the direction indicated by the arrows. The dwell on cam A operates springs 1224 and 1225 to move them out of engagement with their respective break contacts. As will be seen in FIG. 4, operation of spring 1224 out of engagement with its break contact removes positive from spring 420 and hence from start conductor 375 of the $2.00 collector to stop operations over the $2.00 channel. Spring 1225 removes positive from the chain of contacts leading to start conductor 483 of the BM collector thereby to stop operations over the BM channel.

A moment after operations have thus been stopped over both chains, cam B moves spring 1216 out of engagement with its break contact and into engagement with its make contact. Positive is thus removed from conductor 1221A to release the operated indicator relays and thereby erase the values then indicated. Application of positive to the make contact of spring 1215 applies positive to conductor 1222 which is connected to conductors 730 and 731, FIG. 7. A circuit is thus extended to relays 704 and 801, operating those relays. Conductor 1222 also extends a circuit to the indicator relays in each RAM which, such as relay 208, FIG. 2, operates those relays.

Cam B maintains spring 1216 in engagement with its make contact for a short interval, usually about one second, during which interval the indicators are reset to show the new values and at the end of which spring 1216 reapplies positive to conductor 1221A to maintain that indication.

Cam A then restores springs 1224 and 1225 into engagement with their respective break contacts thereby to restore positive on collector start conductors 375 and 483 so that operations may be resumed over both channels.

In the drawings the equipment in the win pool is shown. The place and show pools, indicated diagrammatically in FIG. 12, duplicate the win pool equipment and the timer extends circuits to these pools so that indications of the values registered therein are changed simultaneously with the win pool indications.

Indication of the units digit of the sum registered in the TAM is controlled jointly by the switches 5R and 2R. Operation of relay 704 applies positive to wipers E and F through springs 714 and 713, respectively. If there are odd numbers of $5.00 registrations in switch 5R, the wipers thereof will be engaged with an odd-numbered contact in their respective banks. Under these circumstances, wiper E of switch 5R is connected to wiper C of switch 2R and wiper F of switch 5R is connected to wiper D of switch 2R. The units digit to be indicated will thus be $5.00 plus $2.00 for each step that the switch 2R has taken. Under these circumstances, circuits will be completed according to the following table, to indicate the digit values shown:

5R ON ODD-NUMBERED CONTACTS

2R on Contacts	Wiper C of 2R Closes Circuit to Relay	Wiper D of 2R Closes Circuit to Relay	Units Digit Displayed
1	1	3	7
2	2	4	9
3	1	5	1
4	2	3	3
5	2	5	5
6	1	3	7
7	2	4	9
8	1	5	1
9	2	3	3
10	2	5	5

When switch 5R is in its home position, or has taken an even number of steps therefrom, indicating zero, or an even number of $5.00 transactions registered in the switch, its wiper E will be connected to wiper E of the 2R switch, and its wiper F to the F wiper thereof. Unit digit indication will then consist of zero from the register 5R plus $2.00 for each step switch 2R has taken, and the indication will be as follows:

5R ON EVEN-NUMBERED CONTACTS

2R on Contacts	Wiper E of 2R Closes Circuit to Relay	Wiper F of 2R Closes Circuit to Relay	Units Digit Displayed
1	3	5	2
2	1	2	4
3	1	4	6
4	5	4	8
5	3	4	0
6	3	5	2
7	1	2	4
8	1	4	6
9	5	4	8
10	3	4	0

The tens digit of the sum to be indicated is controlled jointly through wipers B and C of the switch 50R, and wipers C, D, E and F of the switch 10R. The tens indication is accomplished as follows:

With switch 50R on an odd-numbered contact denoting an odd number of $50.00 registrations therein, B wiper on 50R connects to C wiper on 10R, and C wiper on 50R connects to D wiper on 10R.

Tens digit indications are then controlled as follows:

5W 10R on Contacts	C Wiper Closes Circuit to Relay	D Wiper Closes Circuit to Relay	Tens Digit Displayed
1	1	4	6
2	1	3	7
3	5	4	8
4	2	4	9

With 10R on 4, transfer occurs on next step and indication control is transferred and B wiper on 50R connects to E wiper on 10R, and C wiper on 50R connects to F wiper on 10R, and indication continues:

SW 10R on Contacts	E Wiper Closes Circuit to Relay	F Wiper Closes Circuit to Relay	Tens Digit Displayed
5	3	4	0
6	1	5	1
7	3	5	2
8	3	2	3
9	1	2	4

Transfer again occurs as 10R moves into its tenth step position and indication reverts to wipers C and D on 10R.

10R on Contact	C Wiper Closes Circuit to Relay	D Wiper Closes Circuit to Relay	Tens Digit Displayed
10	2	5	5

With 50R on even-numbered contacts denoting an even number of $50.00 registrations therein, B wiper on 50R connects to E wiper on 10R, and C wiper on 50R connects to F wiper on 10R.
Then with:

10R on Contacts	E Wiper Closes Circuit to Relay	F Wiper Closes Circuit to Relay	Tens Digit Displayed
1	1	5	1
2	3	5	2
3	3	2	3
4	1	2	4

transfer occurs on next step of 10R and indication control shifts to wiper C and D of 10R:

10R on Contacts	C Wiper Closes Circuit to Relay	D Wiper Closes Circuit to Relay	Tens Digit Displayed
5	2	5	5
6	1	4	6
7	1	3	7
8	5	4	8
9	2	4	9

Transfer again occurs and indication control reverts to wipers E and F of 10R:

10R on Contact	E Wiper Closes Circuit to Relay	F Wiper Closes Circuit to Relay	Tens Digit Displayed
10	5	4	0

The hundreds digit indication is controlled through the E and F wipers of the switch 50R, indicator relays being operated to indicate digits in accordance with the following table:

50R on Contacts	E Wiper Closes Circuit to Relay	F Wiper Closes Circuit to Relay	Hundreds Digit Displayed
1	3	4	0
2	1	5	1
3	1	5	1
4	3	5	2
5	3	5	2
6	3	2	3
7	3	2	3
8	1	2	4
9	1	2	4
10	5	2	5
11	5	2	5
12	1	4	6
13	1	4	6
14	1	3	7
15	1	3	7
16	5	4	8
17	5	4	8
18	2	4	9
19	2	4	9
20	5	4	0

Switch 50R takes one step for each $50.00 registered and it will be noted that the hundreds digit indicator is changed on every second step of the switch.

The thousands digit of the sum to be indicated is controlled through the D and E wipers of the THR switch, the indicator relays being operated in accordance with the following table:

THR on Contacts	D Wiper Closes Circuit to Relay	E Wiper Closes Circuit to Relay	Thousands Digit Displayed
1	1	5	1
2	3	5	2
3	3	2	3
4	1	2	4
5	5	2	5
6	1	4	6
7	1	3	7
8	5	4	8
9	2	4	9
10	3	4	0

The ten thousands digit of the sum to be indicated is controlled through the E and F wipers of the switch TTHR. This switch contains twenty contacts in each of its banks, although only ten contacts are needed for the ten thousand digit indication, contacts 1 and 11, 2 and 12, etc., being multipled together as indicated, and the value of this digit being controlled in accordance with the following table:

TTHR on Contacts	E Wiper Closes Circuit to Relay	F Wiper Closes Circuit to Relay	Ten Thousands Digit Displayed
1 or 11	1	5	1
2 or 12	3	5	2
3 or 13	3	2	3
4 or 14	1	2	4
5 or 15	5	2	5
6 or 16	1	4	6
7 or 17	1	3	7
8 or 18	5	4	8
9 or 19	2	4	9
10 or 20	3	4	0

The one hundred thousand digit of the value to be indicated is controlled through the C and D wipers of the switch TTHR. It will be noted that these wipers are single-ended wipers, spaced 180° apart, which in effect makes the switch TTHR a 40-point switch. During the first ten steps of switch TTHR, no 100,000 digit appears in the sum to be indicated, and the contacts engaged by wiper C of this switch remain open. With the wiper C engaging contacts 10 to 19, inclusive, of its bank, during each indication cycle positive will be extended to the first and fifth conductors leading into the 100,000 indicator, thereby to operate the first and fifth relays therein to set that indicator to indicate digit 1. During the second ten steps, wiper D engages contacts 1 to 9 in its bank. During each indication cycle, positive will be placed upon conductors 3 and 5 to set the 100,000 indicator to indicate digit 2. When wiper D engages contacts 10 to 19 in its bank, positive is placed upon conductors 2 and 3 to set the 100,000 indicator to indicate digit 3. Thus a maximum of $300,000.00, plus the indication of the lower value digits, is the most that can be registered and indicated in the system shown.

In FIG. 16, there is shown a diagram of the position of each of the twenty-four (24) lamps constituting an indicator for a single digit. In FIG. 13, the five relays by which the tens digit is controlled are shown, together with the circuits by which appropriate lamps are lighted in accordance with the code indicated in FIG. 15 to form the various digits. The details of this arrangement are well known to those skilled in the art, having been shown and described in the Johnston Patent 2,563,041, issued August 7, 1951, to which patent reference is here made for those details. It is sufficient to note herein that the digits are

formed by operation of the relay specified and consequent lighting of the lamp specified in the following table:

Digit	Relays	Lamps
0	3 and 4	2, 3, 8, 12, 16, 20, 23, 22, 17, 13, 9, 5.
1	1 and 5	3, 7, 11, 15, 19, 23.
2	3 and 5	3, 2, 1, 5, 9, 13, 14, 17, 21, 22, 23, 24.
3	2 and 3	1, 2, 3, 4, 8, 11, 16, 20, 23, 22, 17.
4	1 and 2	3, 7, 11, 15, 19, 23, 19, 14, 13, 9, 5.
5	2 and 5	4, 3, 2, 1, 5, 9, 10, 11, 16, 20, 23, 22, 17.
6	1 and 4	3, 2, 1, 5, 9, 13, 17, 22, 23, 20, 16, 11, 10.
7	1 and 3	1, 2, 3, 4, 8, 11, 14, 17, 21.
8	4 and 5	2, 3, 8, 11, 16, 20, 23, 22, 17, 13, 10, 5.
9	2 and 4	2, 3, 8, 11, 12, 16, 20, 23, 22, 10, 5.

The switch bank and wiper arrangements in the TAM, and the indicators associated therewith, are duplicated in each RAM, and during an indication cycle each RAM indication is changed simultaneously with the changing of the TAM indication.

Special Indication

Some racetracks are not equipepd with infield boards upon which are displayed the dollar value of the sums registered in each pool and the individual runners therein, but rather these tracks display only the probable odds in the win pool. To permit use of the totalisator system of the present invention at a track of this kind, special indication arrangements are provided.

In the computing room of the track is a miniature indicator 1230 having a 5-relay combination for each digit, the same as the infield board indicators previously described. In the drawings, only the units digit indicator of the miniature indicator is shown, to avoid an unnecessary complication of the drawing. Also, in the computing room, is a miniature indicator selector key box 1231 containing a key for the TAM and each RAM in the win pool. When it is desired to set up on the miniature indicators the sum registered in the win pool TAM, the operation is as follows.

Key 1232, associated with the TAM, is depressed and places positive on conductor 1233, thereby closing a circuit through relay 705 to negative, and through relay 1205 to negative, and relays 1301 and 1302 to negative, operating those relays.

Relay 705 closes springs 717 against its make contact thereby closing a circuit from positive through spring 718 and its break contact, spring 536 and its break contact, spring 719 and its make contact, to conductor 1235, and thence through indication slave relay 414 and resistance 1223 to negative. If at the moment none of the slave relays in the TAM are operated, relay 414 operates and closes circuits of indication relays 704 and 891, by placing positive on conductors 730 and 731 to operate those relays. Positive is thus placed on the indication leads and extended through proper ones of springs 1217 to 1221, inclusive, to operate the relays in the miniature indicator 1230 in the hereinbefore described manner. Operation of these miniature relays extends this positive to conductor 1234, thereby extending a circuit through the winding of relay 706 to negative, operating that relay. At spring 718, relay 706 opens the circuit previously closed to relay 414, permitting that relay to restore and thereby restore the TAM to normal operation. Spring 718 moving into engagement with its make contact extends positive from spring 717 and its make contact to conductor 1234, thereby to maintain operated the operated relays in the miniature indicator 1230, notwithstanding that the circuits over which these relays were energized are opened by the restoration of relay 414. So long as key 1232 is maintained operated, the indication of the value of the sum registered in the TAM will be maintained on the miniature indicators.

It will be noted that spring 536 is a spring on the $100.00 slave relay 505 of the TAM, this spring being shown detached from its relay to permit simplification of the drawings. Thus should relay 505 be operated at the moment when key 1232 is operated, the above traced circuit to relay 414 is not closed until relay 505 restores. The sum thus registered in the TAM being noted, key 1232 is released to restore the indicator to normal, and key 1235 may be operated to select RAM number one.

Each of the RAM's contains a relay similar to 705, and upon operation of key 1237 such relay is operated over a circuit duplicating that of relay 705, and closed by movement of key 1237 into engagement with its make contact. Positive is thus applied by springs corresponding to 717 of the circuit previously traced, through springs 718 and 536, and thence over conductor 1236 leading to the RAM's, and in RAM number one a spring corresponding to 719 will be closed against its make contact to extend a circuit to the indication slave relay of the RAM. Conductor 1234 is multiplied to all RAM's, so that upon operation of the indicator relays and consequent placing of positive on this conductor, a relay in the RAM corresponding to 706 is operated and positive thereby placed upon conductor 1234 to hold the operated miniature indicator relays in operated position so long as key 1237 remains operated. The sum registered on runner number one thus being indicated, the odds can be computed and displayed in known manner.

The foregoing operation is repeated until the probable odds on all runners are indicated. In view of the time consumed in computing the odds, and due to the fact that the sum registered in the TAM is constantly changing, frequently at a rapid rate, the calculators may recheck the value registered in the TAM between successive checking of the RAM values, so that the probable odds indicated will be as accurate as possible.

Reset

In the drawings the various switches are shown in their normal or home position. At the end of a race, it is necessary to return these switches to their home position in preparation for registrations of sales in the succeeding race. To this end, key 473 is operated to extend a circuit from positive through reset relay 413 in the TAM and corresponding relays in the RAM's. Key 473 is shown in juxtaposition to the win pool TAM for convenience of illustration; however, this key or its equivalent will ordinarily be located on the control panel of the system and upon being operated will extend reset circuits to all TAM's and RAM's in the system, either directly as shown or through suitable relays.

Operation of relay 413 closes spring 474 against its make contact, thereby placing positive upon the A wiper of switch 5R. It will be noted that all of the bank contacts, except the tenth in the bank engaged by the A wiper, are multipled together and connected through spring 710 and its break contact, through the winding of magnet 701 to negative, thereby operating that magnet which opens springs 710, permitting the magnet to restore and step the wipers of switch 5R forward one step. This operation continues in a buzzerlike fashion until wiper A engages its tenth bank contact and comes to rest in its home position.

Operation of relay 414 also closes spring 475 and its make contact, thereby extending a circuit from positive through the A wiper of the switch 2R and the multipled together bank contacts thereof, over conductor 460, through spring 711 and its break contact, through the winding of magnet 702 to negative, operating that magnet which opens its own circuit at spring 711 and operates in buzzerlike fashion to advance the wipers of switch 2R to the home position of the switch.

Operation of relay 413 also closes springs 528 and 529 against their respective make contacts, spring 529 extending the circuit from positive on wiper A of switch 10R, through the first, second, third, fifth, sixth, seventh and eighth contacts of the bank by this wiper, through spring 529 and its make contact, spring 513 and its break contact, thence through the winding of magnet 501 to

negative, operating that magnet which opens its own circuit at spring 513 and operates in buzzerlike fashion to advance wiper A into engagement with either the fourth or ninth contact in its bank. The circuit is then closed, through wiper A and one of these contacts, conductor 553, through spring 528 and its make contact, spring 513 and its make contact, through the magnet 501 to negative, operating that magnet. This operation, through springs 528 and 529 continues until wiper A reaches its home position.

Operation of relay 413 also closes springs 530, 531 and 532 against their respective make contacts, and a circuit may be traced from positive on spring 517 through its break contact, spring 530 and its make contact, through the A wiper of switch 50R and the multipled together contacts 1 to 18 therein, spring 532 and its make contact, through the winding of magnet 502 to negative, operating that magnet which opens its own circuit at spring 517. The magnet operates in buzzerlike fashion to advance the switch wipers until contact 19 is engaged, at which time the circuit previously traced to the A wiper extends to spring 531 and its make contact, and thence through magnet 502 to negative, operating that magnet an additional time to advance the wipers into engagement with the twentieth or home position contact of switch 50R.

Operation of relay 413 also closes spring 533 against its make contact, and a circuit may be traced from positive on the A wiper of the switch THR, the multipled together contacts engaged thereby, conductor 560, through spring 535 and its break contact, spring 533 and its make contact, conductor 555, through the magnet 503 to negative, operating that magnet which opens its own circuit at 535. The magnet operates in buzzerlike fashion to advance its wipers to the tenth or home position contacts in their banks.

Operation of relay 413 closes spring 534 against its make contact, thereby closing a circuit from positive through wiper A if the switch has taken less than twenty steps, through the multipled together contacts engaged by wiper B, spring 534 and its make contact, spring 527 and its break contact, through the winding of magnet 504 to negative, operating that magnet, which opens its own circuit at springs 527 and operates in buzzerlike fashion until wiper B is moved into engagement with the multipled together contacts engaged thereby, and until wiper B moves into the twentieth or home position contact of its bank.

Through the foregoing operation, the switches of the TAM are restored to normal in readiness for a next operation and simultaneously the switches in the various RAM's are restored to normal in a similar manner.

Conclusion

From the foregoing it will be apparent that the totalisator system of the present invention is capable of being used in conjunction with a substantial number of ticket machines in each pool; that it is a two-channel system capable of accepting transactions over both channels simultaneously. Transfers are made from the lower value registers to the next higher value register when necessary, and provisions are made for preventing loss of such transfers should the higher value register be in operation at the moment transfer becomes necessary.

The adding machines of the present invention are simplified by combining in the total adding machine as much of the control equipment as possible, with the result that the individual runner adding machines, which are more numerous in the system, are simplified and hence less costly to build, transport and maintain.

The system is adapted to be used in conjunction with indicators of known design, those indicators being set by circuits extending directly through the wipers and bank contacts of the register switches and without the intervention of register relays. The system is also adapted for use with miniature indicators at installations where infield boards are not available.

While I have chosen to illustrate my invention by showing and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. In a totalisator system, a total adding machine containing two, five, ten, fifty and one hundred unit acceptance relays; a plurality of ticket issuing machines arranged to issue two unit tickets, a plurality of machines for issuing five unit tickets, a plurality of machines for issuing ten unit tickets, a plurality of machines for issuing fifty unit tickets, and a plurality of machines for issuing one hundred unit tickets; a first collector having a main and a reflex chain; means responsive to an operation of a two unit ticket machine for operating the collector to establish a connection from the two unit acceptance relay to the operated ticket machine through either of the two collector chains; a second collector having a main and a reflex chain; means responsive to an operation of a five unit ticket machine for operating the second collector to establish a connection from the five unit acceptance relay over the main chain of that collector to the operated ticket machine; and means responsive to an operation of a ticket machine in the group consisting of the ten, the fifty, and the one hundred unit machines for operating the second collector to extend a circuit from the acceptance relay corresponding to the operated ticket machine, over the reflex chain of that collector to the operated ticket machine.

2. In a totalisator system; an adding machine; a first group of ticket issuing machines; a second group of ticket issuing machines; a collector; a plurality of start relays in said collector, one for each ticket machine in the first group and a corresponding ticket machine in the second group; a collector relay associated with each one of said start relays; means responsive to the simultaneous operation of a plurality of said start relays through simultaneous operation of the associated ticket machines for operating the collector relays associated with the operated start relays one at a time in preferred sequence, to establish connections between the adding machine and operated ticket machines in the first group of ticket machines one at a time in sequence, and then re-operating said collector relays in the same preferred sequence to establish connections between the adding machine and operated ticket machines in the second group one at a time in the same sequence.

3. In a totalisator system; an adding machine; a first group of ticket issuing machines; a second group of ticket issuing machines; a collector; means in said collector responsive to the operation of the ticket machines of the first group for establishing a connection between said adding machine and the operated ticket machines in said group, one at a time in sequence; means in each ticket machine for breaking its connection to the adding machine; a relex relay in said collector; means for operating said relay after the connection to the last operated ticket machine in said first group has been broken, said means in said collector then being re-operated to establish a connection between said adding machine and the operated ticket machines in the second group one at a time in sequence; reset means in said collector operated after the connection to the last operated ticket machine in the second group has been broken, to restore said reflex relay to normal and thereby render said collector again accessible to operated ticket machines in the first group.

4. In a totalisator system; an adding machine; a first group of ticket issuing machines; a second group of ticket

issuing machines; a collector; a start relay in said collector for each ticket machine in the first group and also for a corresponding ticket machine in the second group; a collector relay associated with each start relay; means in each ticket machine for operating the associated start relay; means responsive to a simultaneous operation of a plurality of said start relays for operating the associated collector relays one at a time in preferred order; means responsive to the operation of each collector relay for momentarily establishing a connection between the adding machine and the ticket machine in the first group associated with that collector relay; a reflex relay; means for operating said reflex relay after a connection to the last operated ticket machine in the first group has been made and broken; means responsive to the operation of said reflex relay for re-operating the collector relays one at a time in said preferred order to momentarily establish a connection between the total adding machine and the operated ticket machines in the second group; a reset relay in said collector; means for operating said reset relay after the connection to the last ticket machine in the second group has been made and broken; and means responsive to an operation of said reset relay for restoring said reflex relay thereby to render said collector relays available to the ticket machines in said first group.

5. In a totalisator system; a collector; a plurality of ticket machines arranged in two groups; a plurality of start relays, one common to each ticket machine in the first of said groups and to a corresponding ticket machine in the second of said groups; a collector relay for each start relay; an adding machine; means in each ticket machine for operating the associated start relay; a chain circuit in the collector energized by the operation of a start relay and extended to the associated collector relay to operate that relay; a circuit mens extending from said adding machine to a main chain of normally closed contacts on said collector relays, thence through normally open contacts on the operated collector relay to the associated ticket machine in the first group to connect that ticket machine to the adding machine; means in the adding machine for de-energizing said first mentioned chain circuit thereby to stop the collector; means in the ticket machine for opening said circuit to the adding machine thereby to restore it and to re-energize said first mentioned chain circuit; a reflex relay in said collector; reflex control relay means in said collector operated upon said re-energization of said chain circuit to operate said reflex relay; contacts on said reflex relay opened by its operation to disconnect said circuit means from said main chain; a reflex chain of normally closed contacts in said collector; contacts on said reflex relay closed by its operation to connect said circuit means to said reflex chain; and contacts on the operated collector relay closed thereby to extend said reflex chain to the associated ticket machine in the second group thereby to connect it to said adding machine.

6. In a totalisator system; win and place pool equipment each comprising a total adding machine, a plurality of runner adding machines, and collector means; a plurality of ticket machines each arranged to issue tickets of a predetermined value, which value is to be registered part in each of said pools; an acceptance relay and a plurality of runner selecting keys in each ticket machine; a combine unit containing runner selecting relays, value selecting relays, and acceptance relays for each pool; a combine collector; means responsive to the operation of a ticket machine key for operating the combine collector to establish a circuit extending in series through the selected runner selecting relay, the ticket machine acceptance relay and the value selecting relay corresponding to the value of the tickets the operated ticket machine is arranged to issue, said runner selecting and value selecting relays operating over said circuit; means responsive to the operation of said runner and value selecting relays for closing circuits to the selected runner adding machines in both pools, which circuits extend through corresponding acceptance relays in the combine unit to the total adding machines in both pools thereby to effect registrations in both pools, said combine acceptance relays operating upon completion of said registrations; an acknowledging circuit in said combine unit closed by the operation of both pool acceptance relays therein to operate the ticket machine acceptance relay; and contacts on said acceptance relays through which the circuit of the relay extends, which contacts are opened by the operation of the relays to restore the equipment to normal.

7. A totalisator system as specified in claim 6, in which the operated ticket machine is arranged to issue four unit value tickets, of which value two units are registered in each of said pools.

8. A totalisator system as specified in claim 6, in which the operated ticket machine is arranged to issue ten unit value tickets, of which value five units are registered in each of said pools.

9. A totalisator system as specified in claim 6, in which the circuit over which the runner and value selecting relays are operated includes a resistance and in which the combine acknowledging circuit closed by the operation of both pool acceptance relays in the combine unit shortcircuits that resistance to increase the current flowing through the ticket machine acceptance relay thereby to operate that relay.

10. A totalisator system as specified in claim 6, in which the circuits from the combine unit to the total adding machine in each pool is extended thereto by the collector means in that pool.

11. In a totalisator system; win and place pool equipment each comprising; total and individual runner adding machines and collector means; ticket machines each arranged to issue tickets of a predetermined value, which value is to be registered part in each of said pools; an acceptance relay and a plurality of runner selecting keys in each ticket machine; a combine collector; a combine unit containing runner selecting relays, value selecting relays, and an acceptance relay for each of said pools; means responsive to the operation of a ticket machine key for operating said combine collector to establish a circuit through the runner selecting relay corresponding to the operated key, the acceptance relay in that ticket machine and the value selecting relay corresponding to the value of the ticket that ticket machine is arranged to issue, said runner and value selecting relays operating over said circuit; operation of said relays establishing a circuit from the selected runner adding machine in the win pool, through a win pool acceptance relay in the combine unit, through the win pool collector means to the win total adding machine to operate said adding machines and then operate said acceptance relay; operation of said runner and value selecting relays also establishing a circuit from the selected runner adding machine in the place pool, a place pool acceptance relay in the combine unit, through the place pool collector means to the place pool total adding machine to operate said adding machines and then operate said place pool acceptance relay; an acknowledging circuit in said combine unit closed by the operation of the win and place pool acceptance relays therein to operate the ticket machine acceptance relay; and normally closed contacts on each acceptance relay included in the circuit over which that relay is operated and opened by the operation of that relay to restore the associated equipment to normal.

12. In a totalisator system; win, place and show pool equipment each comprising a total adding machine, a plurality of runner adding machines, and collector means; a plurality of ticket machines each arranged to issue tickets of a predetermined value, which value is to be registered part in each of said three pools; an acceptance relay and a plurality of runner selecting keys in each of said ticket machines; a combine unit containing runner selecting relays, value selecting relays and acceptance

relays for each pool; a combine collector; means responsive to the operation of a ticket machine key for operating said combine collector to establish a circuit extending in series through the selected runner selecting relay, the acceptance relay in the ticket machine containing the operated key and the value selecting relay corresponding to the predetermined value of tickets issued by that machine, said runner selecting and value relays operating over said circuit; means responsive to the operation of the runner selecting and value relays for closing circuits to the selected runner adding machines in each pool, which circuits extend through corresponding pool acceptance relays in the combine unit to the total adding machines in each pool, thereby to effect registrations in the three pools, said combine unit acceptance relays operating upon completion of said registrations; an acknowledging circuit in said combine unit closed by the operation of the three pool acceptance relays therein to operate the ticket machine acceptance relay; and contacts on said acceptance relays through which the circuit of the relay extends, which contacts are opened by the operation of the relays to restore the equipment to normal

13. A totalisator system as specified in claim 12, in which the operated ticket machine is arranged to issue six unit value tickets, of which value two units are registered in each of the three pools.

14. A totalisator system as specified in claim 12, in which the operated ticket machine is arranged to issue fifteen unit value tickets, of which value five units are registered in each of the three pools.

15. A totalisator system as specified in claim 12, in which the circuit over which the runner and value selecting relays are operated includes a resistance and in which the combine unit acknowledging circuit closed by the operation of the three pool acceptance relays in the combine short-circuits that resistance to increase the current flowing through the ticket machine acceptance relay thereby to operate that relay.

16. A totalisator system as specified in claim 12, in which the circuits from the combine unit to the total adding machine in each of the three pools is extended thereto by the collector means in that pool.

17. In a totalisator system; win, place and show pool equipment each comprising: total and individual runner adding machines and collector means; ticket machines each arranged to issue tickets of a predetermined value which is to be registered part in each of said pools; an acceptance relay and a plurality of runner selecting keys

in each ticket machine; a combine collector; a combine unit containing runner selecting relays, value selecting relays, and an acceptance relay for each of said pools; means responsive to the operation of a ticket machine key for operating said combine collector to establish a circuit through the runner selecting relay corresponding to the operated key, the acceptance relay in that ticket machine, and the value selecting relay corresponding to the value of the ticket that ticket machine is arranged to issue, said runner and value selecting relays operating over said circuit; operation of said relays establishing a circuit from the selected runner adding machine in the win pool through a win pool acceptance relay in the combine unit, through the win pool collector means to the win pool total adding machine to operate said adding machines and then operate said acceptance relay; operation of said runner and value selecting relays also establishing a circuit from the selected runner adding machine in the place pool, a place pool acceptance relay in the combine unit, through the place pool collector means to the place pool total adding machine to operate said adding machines and then operate said acceptance relay; operation of said runner and value selecting relays also establishing a circuit from the selected runner adding machine in the show pool, through a show pool acceptance relay in the combine unit, through the show pool collector means to the show pool total adding machine to operate said adding machines and then operate said acceptance relay; an acknowledging circuit in said combine unit closed by the operation of said three acceptance relays therein to operate said ticket machine acceptance relay; and normally closed contacts on each acceptance relays included in the circuit over which that relay is operated and opened by the operation of that relay to restore the associated equipment to normal.

References Cited in the file of this patent

UNITED STATES PATENTS

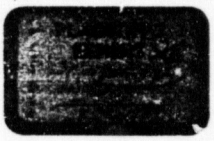
2,066,698	Simpson	Jan. 5, 1937
2,121,164	Robinson	Jan. 21, 1938
2,179,698	Levy et al.	Nov. 14, 1939
2,182,875	Levy	Dec. 12, 1939
2,195,267	Bush	Mar. 26, 1940
2,432,324	May	Dec. 9, 1947
2,479,681	Handley	Aug. 23, 1949
2,563,041	Johnston	Aug. 7, 1951
2,605,967	Stone	Aug. 5, 1952
2,680,561	Handley	June 8, 1954

BEST COPY AVAILABLE

A354

WESTBURY ELECTRONIC CORPORATION

ROOSEVELT RACEWAY, WESTBURY, NEW YORK



1963

For release Thursday, March 7, 6 A.M.

WESTBURY ELECTRONIC TOTE SYSTEM SHOWN

WESTBURY, N. Y., - The Westbury Electronic Corporation presented its revolutionary all-electronic totalizator system, in full operation, yesterday at Roosevelt Raceway.

The full scale operation continues today and tomorrow before some 1,000 invited representatives of thoroughbred, harness and greyhound racing associations from all parts of the United States and seven foreign countries.

The Westbury Electronic Corporation is wholly owned by Roosevelt Raceway, Inc., and the Digitronics Corporation of Albertson, L.I. None of its shares are publicly held or available for sale to the public.

Completely solid-state and digital, the Westbury system is the result of a three-year research and engineering program by the Digitronics Corporation and a team of racing experts from Roosevelt Raceway.

For the showing, an entire division of the Roosevelt betting plant has been equipped with the Westbury system, including 20 selling windows and an internal "tote" center and calculating room. The full infield board is employed to display odds, horse and pool totals and pay-off prices.

The system employs two large-capacity general purpose computers, dual electronic aggregators, magnetic core memory units, punched paper tape and magnetic recording and high speed printing units. The demonstration showed that the system is impervious to heat, cold, sand and dust, humidity variations and electrical disturbances, natural or man-made.

more

It is presently programmed to instantly calculate and display every conceivable situation faced in racing, including the ability to service a 15-horse dead heat. The system accommodates up to 29 betting positions in regular win, place and show betting and also 29 starters in either or both parts of the daily double. It is capable of offering quinielas, quinielas exacta, tierce, double-doubles, V-5 and Pick-6.

At the showing there are used ticket-issuing machines capable of selling "wild", meaning the same mechanism is capable of vending tickets for win, place or show. The issuers can be modified also to sell tickets of different values from $2 to $100.

An outstanding feature is the system's ability to sell daily double tickets to post time of the first race and to calculate and display daily double pay-off possibilities instantly and automatically following the first race, regardless of scratches or dead heats.

Complete end-of-race accounting is accomplished in 51 seconds, including printed records of each transaction at each window, by horse, by money denomination and by position pool. End-of-day permanent accounting records are produced in printed form and on punched paper tape in less than seven minutes after the close of business.

The system presently has the capacity to serve a racetrack with 1024 selling windows, more than twice the present need for the largest tracks in the United States. With modifications, the capacity may be quadrupled.

Each of the issuing machines, which are capable of vending upwards of 4,000 tickets for each race, is equipped with a built-in sealed magnetic tape recording system which automatically records the complete transactions of each machine. Before releasing a ticket for sale, each transaction is reviewed and certified by the computer central in one-quarter of 1,000th of a second.

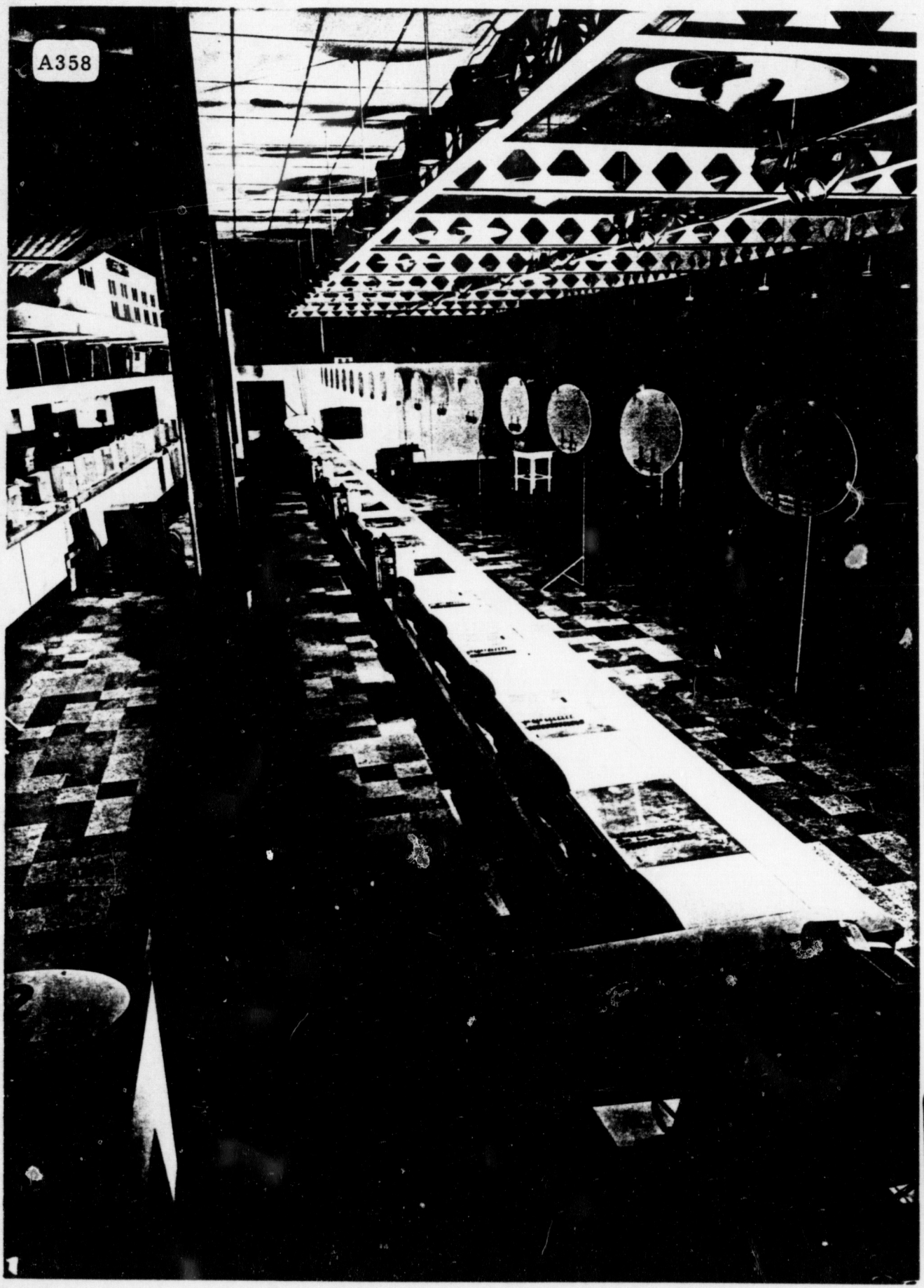
The error rate possibility is one in 400,000,000,000,000 (one in 400 trillion) calculations, according to Albert A.Auerbach Director of Development of Westbury Electronic, who adds:

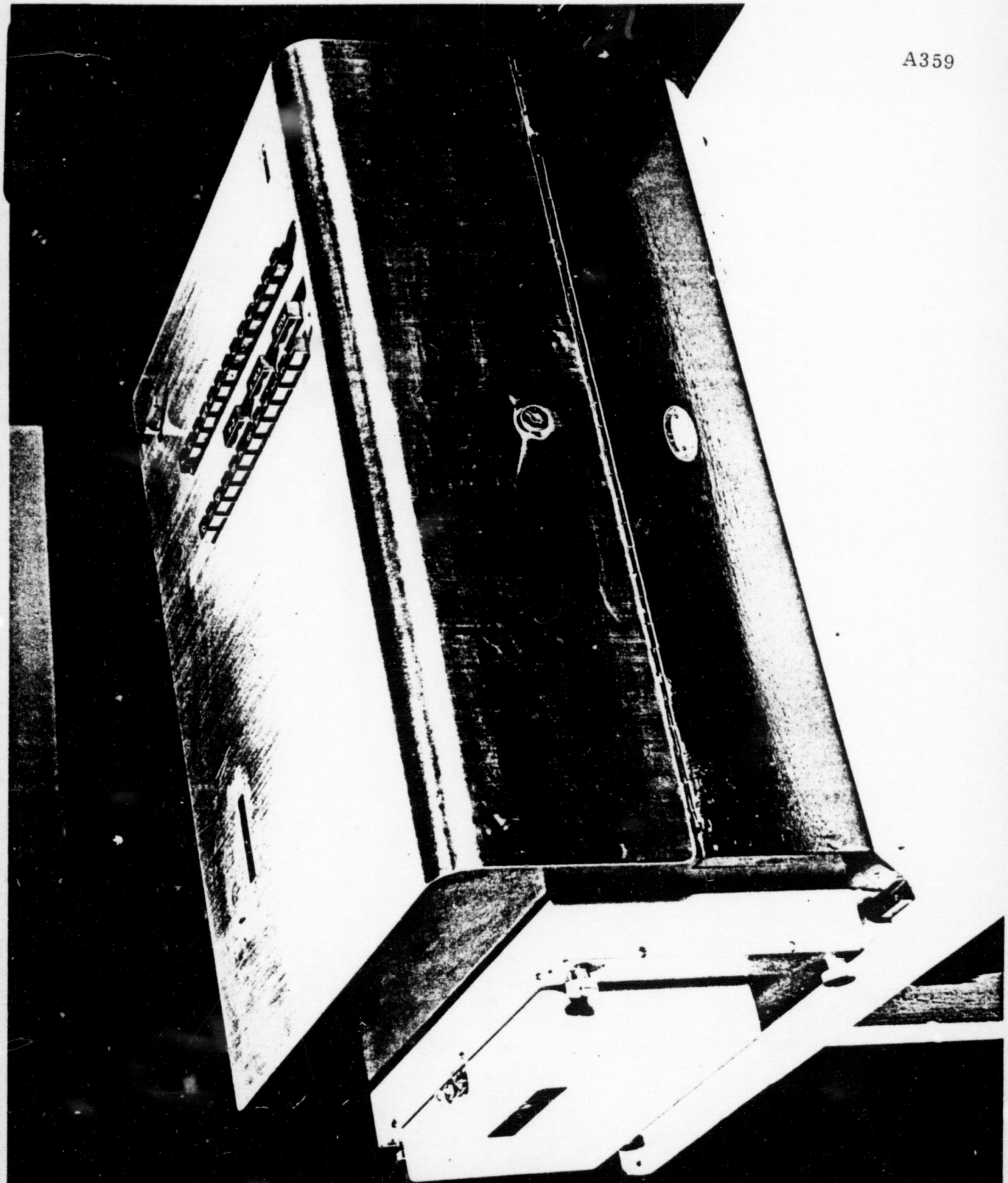
"We offer this system with complete confidence. It is the first new concept in wagering service in almost 30 years and employs the most modern technology to serve the practical needs of the race-going public."

###

For additional information
please phone Nick Grande,
516 PIoneer 6-6000

A357

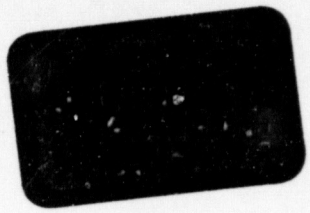

A358



A359

A360

Claim 20, Patent 3,252,149



A system comprising

(A) a plurality of ticket issuing machines wherein each of said ticket issuing machines comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) an acknowledgement signal responsive means for issuing a ticket having indica recorded thereon which is related to a latched switch,

(B) generating means responsive to said selected transaction signal for generating signals representing the entry associated with the particular transaction signal and representing the particular ticket issuing machine, and

(C) transaction calculating means for performing a calculation on said generated signals and transmitting an acknowledgement signal to said acknowledgement signal responsive means for issuing a ticket only if the transaction is correct.

Claim 21. Patent 3,252,149

The system of claim 20 wherein said transaction calculating means comprises

(A) register means having addressed aggregation registers for storing the aggregations of transactions,

(B) means responsive to the signals generated by said generating means for selecting the addressed aggregation register,

(C) means for reading out the contents of said selected addressed aggregation register,

(D) means for updating the contents of said selected addressed aggregation register,

(E) means for returning said updated contents to said selected addressed aggregation register, and

(F) means for transmitting said acknowledgement signal to the acknowledgement signal responsive means when said updated contents are returned to said selected addressed aggregation register.

A362

Claim 22. Patent 3, 252, 149

The system of claim 20 further comprising a ticket issuing machine memory comprising

(A) a plurality of addressed memory positions each storing the number of transactions made by a ticket issuing machine,

(B) address-selection means for receiving the signals generated by said generating means for selecting the particular memory position associated with the particular ticket issuing machine,

(C) reading means for reading out the contents of the selected memory position,

(D) updating means for updating the read-out contents, and

(E) returning means for returning the updated contents to the selected memory position.

Claim 23. Patent 3,252,149

A system comprising

(A) a plurality of ticket issuing machines wherein each of said ticket issuing machines comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry in a race for transmitting a selected transaction signal associated with the selected entry,

(2) a rejection signal responsive means for unlatching any latched switches,

(3) and an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch,

(B) switch means which comprises a plurality of selectively actuatable transaction-prevention switches for generating non-allowed signals associated with entries upon which transactions will not be allowed,

(C) comparing means for comparing the selected transaction signal with the non-allowed signals to generate a nontransaction signal when a particular transaction signal and a nonallowed signal represent the same entry,

(D) rejection means responsive to a non-transaction signal from said comparing means for transmitting a rejection signal to the rejection signal responsive means of the ticket issuing machine for unlatching any latched switches, and

Claim 23. Pat. 3,252,149 Cont'd

(E) means for transmitting an acknowledgement signal to the acknowledgement signal responsive means of the ticket issuing machine for issuing a ticket only if the selected transaction is allowed.

Claim 24. Patent 3,252,149

A system comprising:

(A) a plurality of ticket issuing machines each including a plurality of selectively actuatable transaction selection switches each associated with a different entry for transmitting when actuated a selected entry transaction signal associated with a selected entry to an output line when the ticket issuing machine receives an interrogation signal,

(B) scanning means for sequentially and periodically selecting each of the ticket issuing means for interrogation,

(C) interrogating means for generating an interrogation signal for transmission to the selected ticket issuing machine,

(D) sensing means for sensing for a selected entry transaction signal, and

(E) means for stepping said scanning means to the next ticket issuing machine when said sensing means does not sense a selected entry transaction signal.

Claim 25.

The system of claim 24 further comprising means for processing a selected entry transaction signal sensed by said sensing means before the stepping of said scanning means to select the next ticket issuing machine.

Claim 26. Patent 3,252,149

A system comprising:

(A) a ticket issuing machine which comprises

(1) a plurality of selectively actuatable and latching transaction-selection switches each associated with a different entry for transmitting a selected entry transaction signal associated with tne selected entry to an associated output line,

(2) a rejection signal responsive means for unlatching any latched switches upon receipt of a rejection signal, and

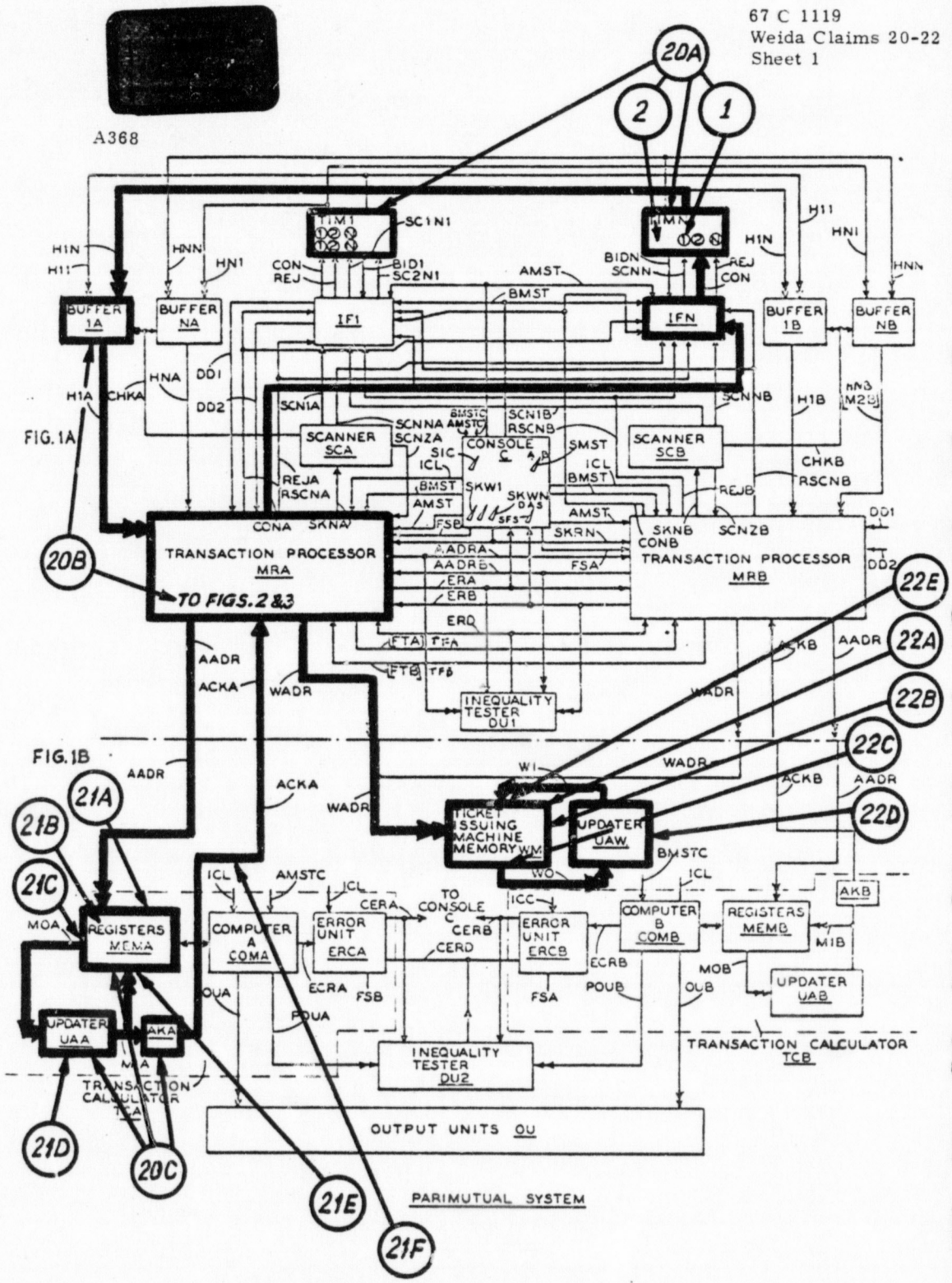
(3) an acknowledgement signal responsive means for issuing a ticket having indicia recorded thereon which is related to a latched switch,

(B) entry checking means for checking for erroneous selected entry transaction signals and for transmitting a rejection signal to said ticket issuing machine when erroneous selected entry transaction signals are sensed, and

(C) means for transmitting acknowledgement signals to said ticket issuing machine when the selected entry transaction signal is correct.

Claim 27. Patent 3,252,149

The system of claim 26 wherein said entry checking means comprises means for sensing for the simultaneous presence of more than one selected entry transaction signal.



EDP TOTALISATOR SYSTEM INVENTION
(Claims 20-22)

FIG. 3

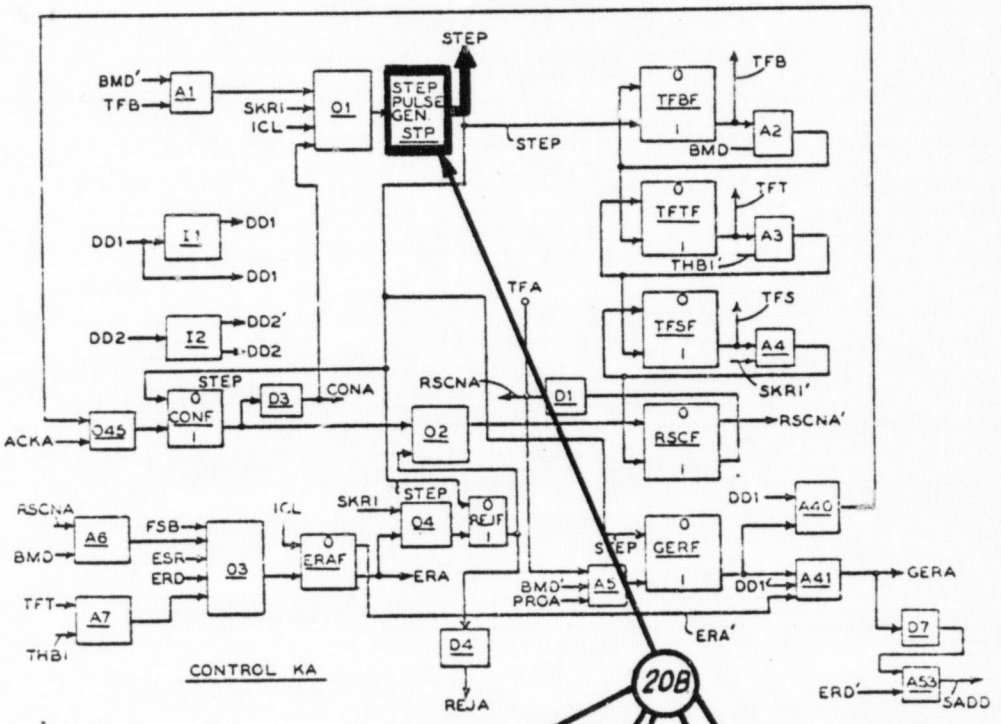
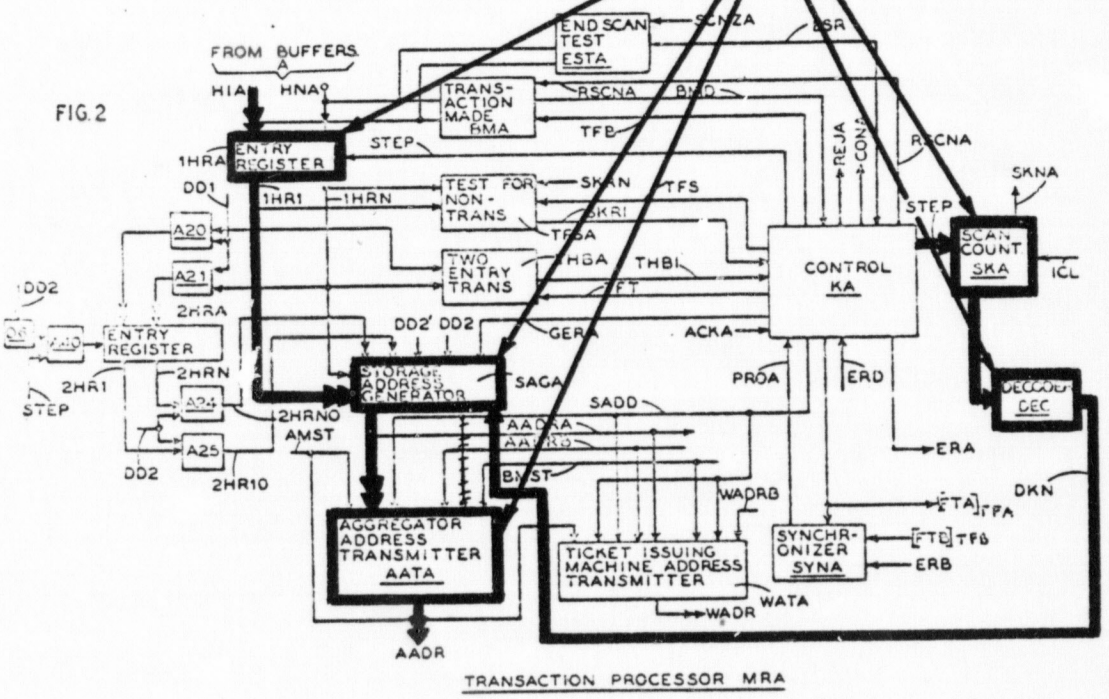
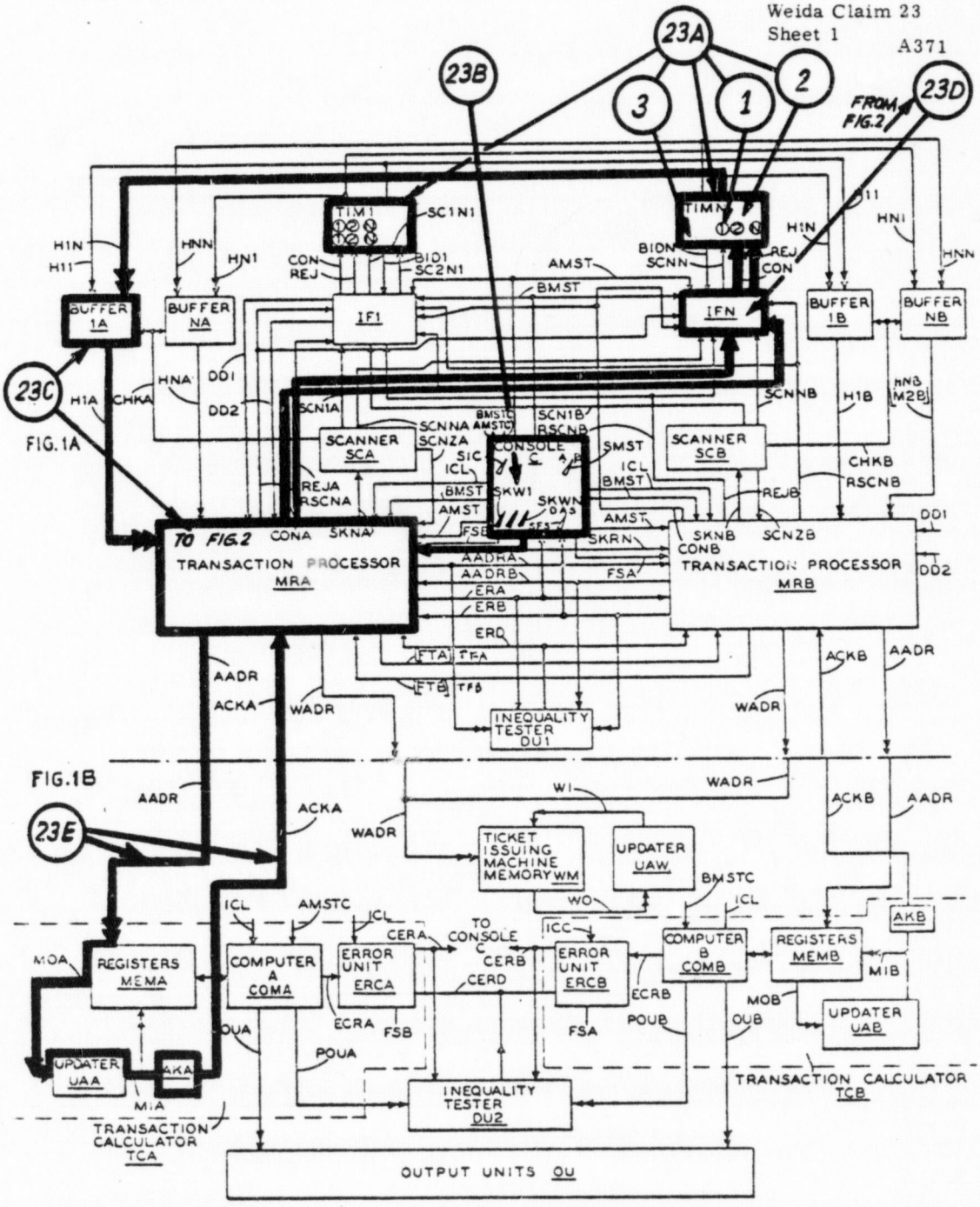

STEP
BMD'
TFB
A1
SKRI
ICL
O1
STEP PULSE GEN STP
TFBF
A2
BMD
TFT
TFTF
A3
THBI
TFS
TFSF
A4
SKRI'
DD1
I1
DD2
I2
TFA
STEP
CONF
D3
CONA
RSCNA
D1
ACKA
O45
O2
RSCF
RSCNA'
DD1
A40
GERF
A41
GERA
BMD'
PROA
A5
ERA'
D7
ERD'
A53
SADD
RSCNA
A6
FSB
ESR
ERD
O3
ICL
SKRI
O4
REJF
ERAF
ERA
TFT
A7
THBI
D4
REJA
CONTROL KA
20B

FIG. 2


FROM BUFFERS A
HIA
HNA
END SCAN TEST ESTA
SCNZA
ESR
TRANS-ACTION MADE BMA
RSCNA
BMD
TFB
REJA
CONA
RSCNA
1HRA
ENTRY REGISTER
STEP
DD1
1HR1
1HRN
TEST FOR NON-TRANS
SKAN
SKRI
TFS
TFSA
SKNA
STEP
A20
A21
TWO ENTRY TRANS
THBA
THBI
FT
CONTROL KA
SCAN COUNT SKA
ICL
DD2
2HRA
DD2' DD2
GERA
ACKA
ENTRY REGISTER
2HRN
2HR1
STEP
STORAGE ADDRESS GENERATOR
SAGA
PROA
ERD
DECODER DEC
A24
2HRNO
AMST
SADD
AADRA
AADRB
A25
DD2
2HR10
BMST
ERA
DKN
WADRB
ETA
TFA
AGGREGATOR ADDRESS TRANSMITTER AATA
TICKET ISSUING MACHINE ADDRESS TRANSMITTER
SYNCHR-ONIZER SYNA
FTC
TFB
ERB
WATA
WADR
AADR
TRANSACTION PROCESSOR MRA

PLAINTIFF'S
EXHIBIT
12



PARIMUTUAL SYSTEM

NON-ALLOWED RUNNER EDP SUB-SYSTEM INVENTION
(Claim 23)

[redacted]

FIG. 3

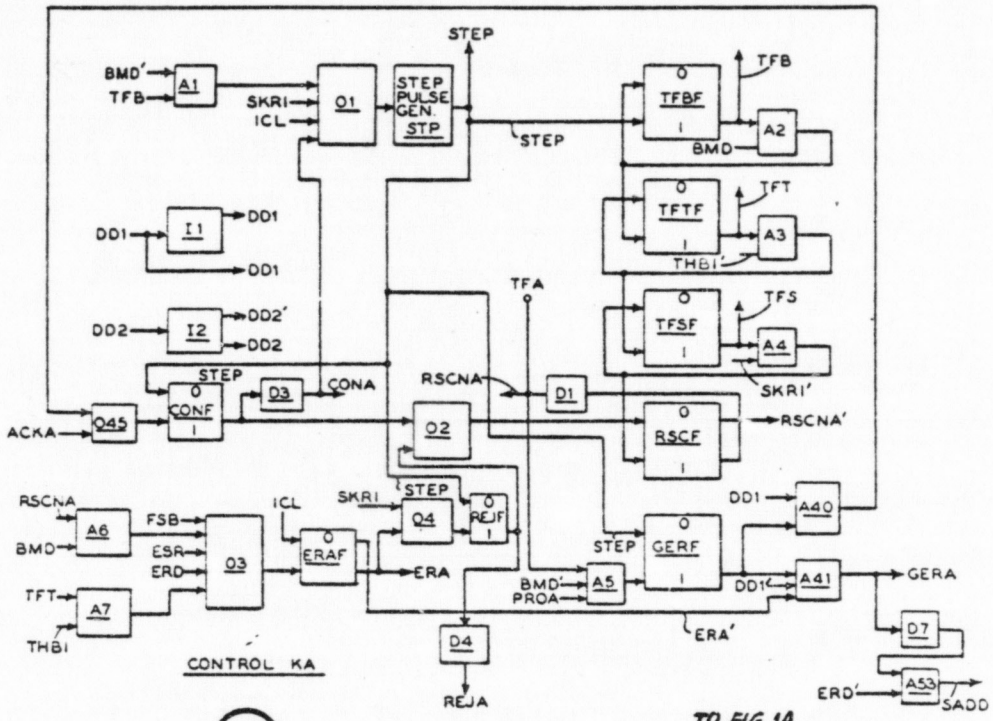
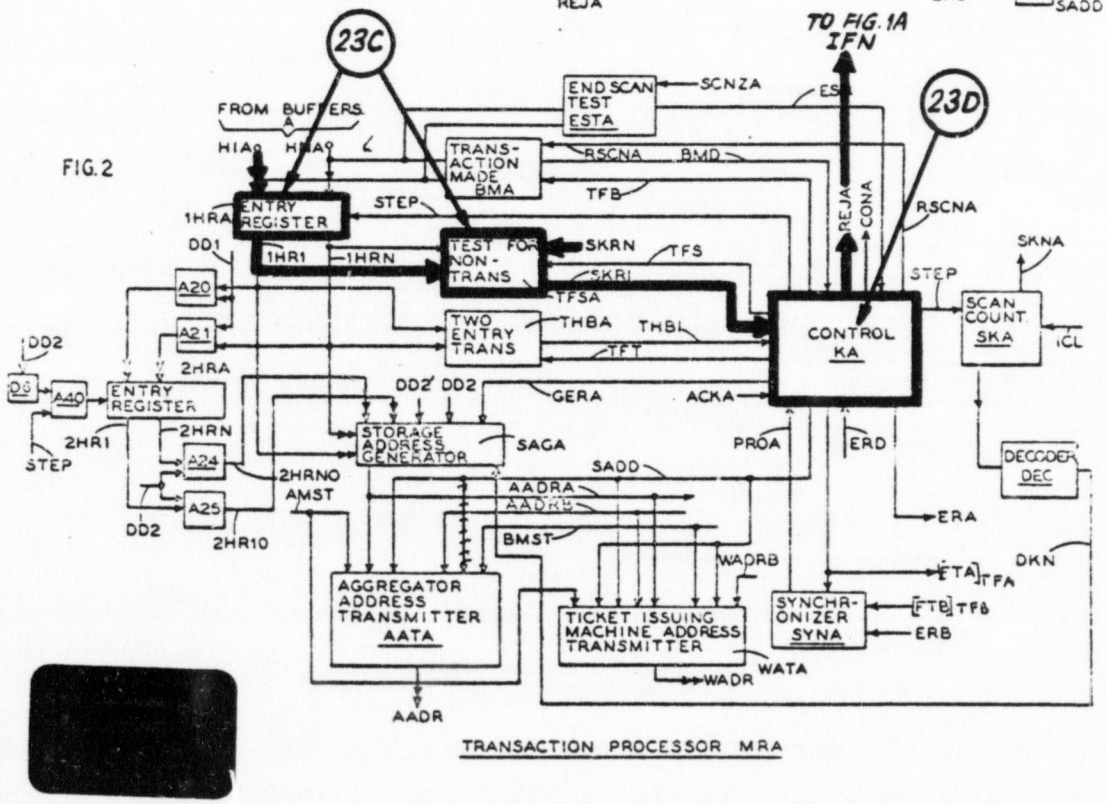
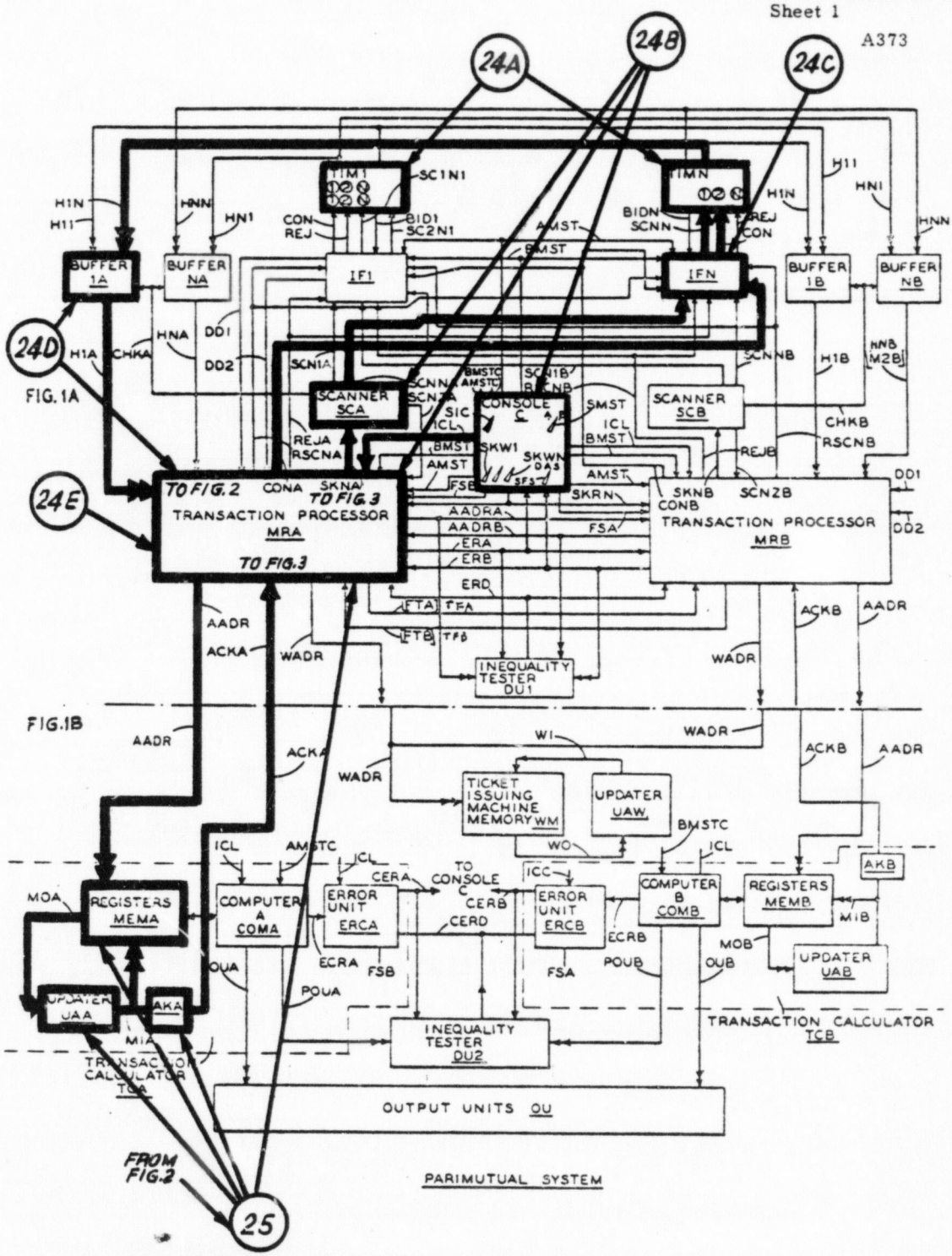


FIG. 2



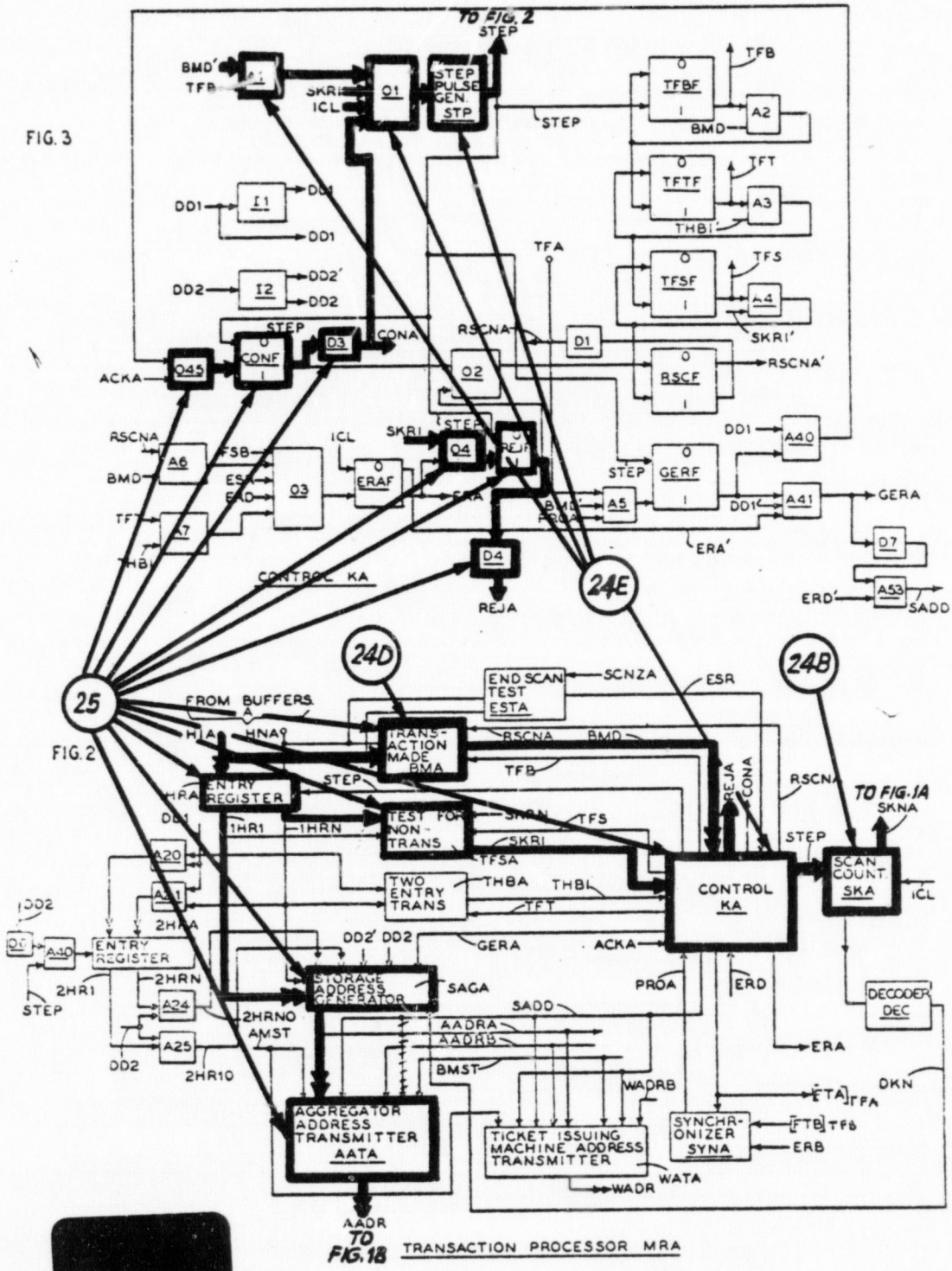
TRANSACTION PROCESSOR MRA

A373

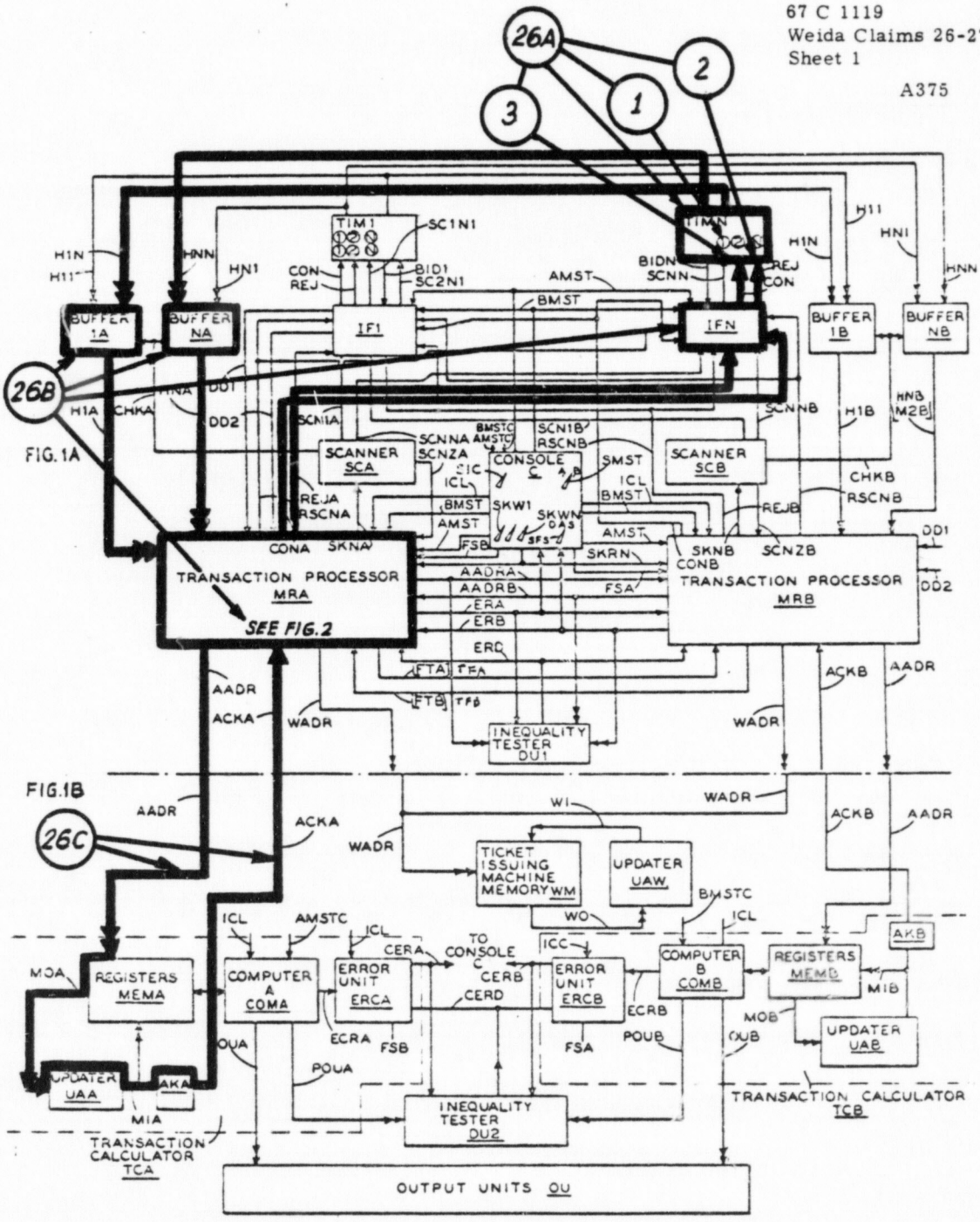


TIM SCANNING EDP SUB-SYSTEM INVENTION
(Claims 24-25)

FIG. 3



TRANSACTION PROCESSOR MRA

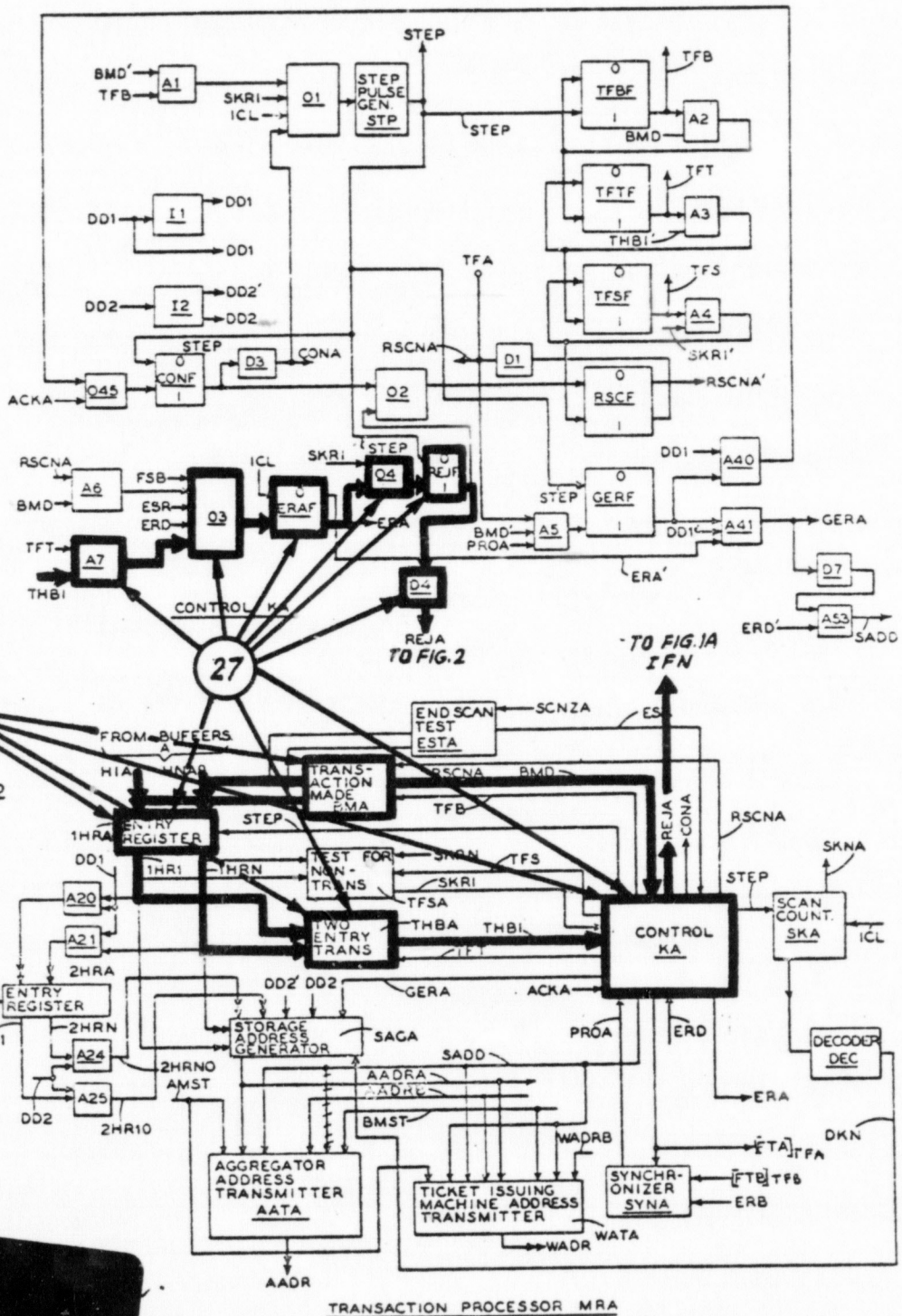


PARIMUTUAL SYSTEM

ERRONEOUS DATA CHECKING EDP SUB-SYSTEM INVENTION
(Claims 26-27)

[redacted]

FIG. 3



TRANSACTION PROCESSOR MRA

A377

STATE OF NEW YORK
DEPARTMENT OF
TAXATION AND FINANCE
ALBANY

JOSEPH H. MURPHY
COMMISSIONER OF TAXATION AND FINANCE
CHAIRMAN TAX COMMISSION

May 28, 1964

Westbury Electronic Corp., Inc.
1100 Old Country Road
Westbury, L. I., New York

Gentlemen:

This is in reply to your letter of May 21, 1964 with reference to the Westbury Electronic Totalizator System.

After analyzing the results of tests and inspections conducted during the trial period of twenty-five racing days at Roosevelt Raceway from April 15 through May 13, 1964, the State Tax Commission has concluded that the Westbury Electronic Totalizator System operates in a satisfactory manner, complies with the requirements of the statute, and is adequate to protect State revenues from the conduct of pari-mutuel betting. These conclusions refer, of course, to the system, machines and equipment tested and inspected during said trial period, including ticket issuing machines, aggregating and calculating equipment, electronic memory, data communication facilities, automatic and manual display equipment, high-speed printers and related recording equipment.

Very truly yours,

JOSEPH H. MURPHY
Commissioner

[redacted]

BEST COPY AVAILABLE

P226

STATE OF NEW YORK
DEPARTMENT OF TAXATION AND FINANCE
ALBANY, NEW YORK

Release No. 21
From: Frank H. Otwell
Phone: GL 7-4242

A378

For release in the AMs of Friday, June 12, 1964. . .

ALBANY, June 11 -- Joseph H. Murphy, President of the State Tax Commission, announced that the Commission has issued the following ruling applying to pari-mutuel betting equipment for race tracks:

"Sections 6 and 42 of the Pari-Mutuel Revenue Law (Chapter 254 of the Laws of 1940, as amended) require that all machines and equipment for use in the conduct of pari-mutuel betting at race tracks in the State of New York be approved by the State Tax Commission, and by the State Racing Commission or the State Harness Racing Commission as the case may be, before they may be used.

"Such approval will be given by the State Tax Commission only upon the application of a corporation or association duly authorized to conduct pari-mutuel betting.

"However, a manufacturer of machines or equipment, including electronic systems, designed for use in pari-mutuel betting, upon application to the State Tax Commission, may arrange for a demonstration thereof subject to such tests and inspections as the Commission may require. The cost of any such demonstration, testing and inspection must be borne by the manufacturer. If the equipment operates in a satisfactory manner, complies with the requirements of the Statute, and is judged adequate to protect State revenues from the conduct of pari-mutuel betting, the Commission will so advise the manufacturer."

[redacted]

-30-

JUN 30 1964

PR 17

May 11, 1965

Mr. Alvin L. Weil, President
Roosevelt Raceway, Inc.
Westbury, L.I., New York

Dear Mr. Weil:

This is to inform you of the approval of the use of Western Totalisator ticket issuing machines, to be operated in conjunction with the previously approved Westbury Electronic Corporation Totalisator System, for a trial period of 30 days on the basis of tests conducted by our staff on May 4, 1965.

This approval extends to Single race, Daily Double and Twin Double operations during the trial period and is subject to the following conditions:

a. Representatives from the Administrative staff of the New York State Department of Taxation and Finance must be granted access to conduct on-site inspection of the system and review operations at any time during the trial period.

b. The State Tax Commission reserves the right to terminate the live test at any time during the trial period.

c. The Roosevelt Raceway agrees to pay to the State of New York for any night on which the Western Totalisator ticket issuing machines do not function, an amount equal to the nightly average revenue received by the State of New York from operations at Roosevelt Raceway from each parimutuel pool on each race during the current racing meet, for every parimutuel pool which may be cancelled because of this condition.

BEST COPY AVAILABLE

5-11-65

A380

d. If the installation or operation of the Western Totalisator ticket issuing equipment results in or is the indicated cause of a contractual dispute or a labor dispute with any union or group of employees which results in the disruption of the operation of the parimutuel system for all or any part of the racing program, then in that event Roosevelt Raceway agrees to pay and guarantees the payment of an amount equal to the nightly average revenue received by the State of New York from each parimutuel pool on each race during the current racing meet, for every parimutuel pool so disrupted or which may be cancelled while such dispute or disputes may be pending, regardless of the merits of such dispute or disputes.

It is anticipated at this time that our staff will be prepared to conduct an on-site review and inspection under actual racing conditions during the week of June 7.

This approval will be effective only on the agreement of Roosevelt Raceway, Inc., to abide by the conditions herein.

This approval shall not be construed as an expression of the opinion of the State Tax Commission as to the respective rights and liabilities of Roosevelt Raceway, Inc., under any arrangements which it may have with any machine company or any union or group of employees, and nothing herein contained is intended to have this effect.

You will, therefore, please execute the agreement set forth below in duplicate and return one of the original copies to this office for our files together with a certified copy of the resolution of the Board of Directors of Roosevelt Raceway, Inc., approving the agreement and authorizing its execution.

Very truly yours,

JOSEPH H. MURPHY
President
State Tax Commission

Roosevelt Raceway, Inc., agrees to comply with all the terms and conditions of the above approval.

Dated: May 11, 1965

(SEAL)

Roosevelt Raceway, Inc.
By _____
President

BEST COPY AVAILABLE

[redacted]

October 20, 1961 A381

Mr. William Wade

Re: Norwalk Juvenile Case

Arrived in Norwalk 9:30 A.M., Monday 10/16, met Mr. Archbald and was met by Mr. [illegible] of the Norwalk Tote Company. Mr. Nakamura and Mr. Archbald's assistant, gave a complete history of the company. We spent the entire day with Mr. Erickson and Mr. Nyquist. The Tonawanda and Bronx now on Electronic Tote Company with vault at Yon. They have a tote unit and 20 Australian harness pay through a mock-down procedure being readied for Batavia races. The entire crew are to have this unit ready for official test by December 1961, and expect the New York City Department here for this test to receive an okay for usage in New York State. A Mr. Sandoval is in charge of this operation for the Yonkers people and has on hand a Burroughs computer to calculate the pay prices of all races and exotics.

According to Erickson, the Yonkers people have put $400,000 into the project with a return to them of $139,000., making a net of $320,000 investment paid by the Yonkers people. They also purchased 20 Australian harness at $2,000 each. As mentioned before, they are on line and being serviced by Sandoval and several electricians. The Yonkers people had Barsky and Lubin here at Goerdon in July to check on the progress of this tote. Erickson and Nyquist claim they could have sold Chile, South America, but the Yonkers people stopped that sale. Erickson claimed they are very near signing a contract for two tracks in the Argentina with 600 units complete installation with all

P.T.O.

the various types of betting used in that area. They further claim that this contract is being handled by a Dr. Hoffman through a Swiss company.

They also claim they had an offer from Digitronics to buy their company; also, that Oscar Levy of the American Tote gave them $10,000 for an option to purchase their company. Mr. Levy wanted all rights, including France, which he could not get. Levy failed to exercise this option.

I shall not mention all the money transactions as I am sure Mr. Auerbach has recorded this.

Had a complete look at the building where they are operating and, while I am not qualified to judge shop operations, it certainly did not impress me as being organized to handle any sizable amount of production. Upon questions asked by Mr. Auerbach with reference to cost, etc. of many component parts, neither Ericksson nor Ny could give costs readily.

They had several partly completed issuers which were manufactured to this point by a Stockholm company called Cali. None of these were complete and I understand they need more financing to finalize these TIMS. As far as I could determine from the partly finished TIMS, they appeared to be useful. Having none completed, nor any prototypes, this was purely speculation on my part.

Ericksson laid many plans on what the Carrus Brothers in France had said and as soon as the Swedish Tote can complete the Vincennes order, which at this time is mainly the TIMS, Ericksson was

BEST COPY AVAILABLE

sure he could get the Swedish Tote order for Longchamps track through the Carrus Brothers, who claim to advise the Longchamps people on matters such as this. Of course, all things being equal, this would be a big step for the Swedish Tote Company.

Went to the Åby track for a look at the tote installation. This track not operating at the time, but they have a very compact installation of 60 TIMS of the cash-register type, the reason for this type TIM being that no other type was available at the time and the Aby people were satisfied with this type.

This TIM would never be satisfactory for American racing. The tote at the Åby track seemed to operate very satisfactorily. They only sell Win and Place with no Doubles and a rather small installation. They do put off-course betting into the tote prior to the opening of each race. When questioned they claimed their sales per TIM were about 200 tickets per race. They are equipped for 24 runners. They do not use a price computer and calculate the prices manually.

I questioned Ericksson regarding using a known computer for price calculations and he said he would use one.

I then asked himwhat the cost would be for the purchase of an installation of 500 TIMS, this installation to include wiring, odds boards, housing, etc. His answer was between $1,000,000 and $1,300,000., all depending on the number of extras required by the track.

His estimate of the type of TIMS he intends building for totes would run between $700 and $900 each, depending upon the quantity of the order.

Spent the greater part of Friday with the Carrus people (Pierre, Jacques and father), heard their story and what they are trying to do along the lines of automation, as up to now their operation has been 100% manual. The Carruses seemed very much pleased with the Swedish company to date. They have built an issuer for the type of betting in France. This, of course, greatly differs from the American operations. We then went to Vincennes track and looked at the progress of the installation and they used the prototype for testing. At this demonstration the tote seemed to work perfectly normally. Of course, this needs and will get a great deal more testing when they have connected many TIMS to the line. As you may know, their plans call for only a partial installation at the outset, possibly next May or June. They would only be using this on Jimmule type of betting. This is similar to our quinela and they will be using about 40 TIMS for this operation.

It is with this experience that they will decide on future operation in all types of betting such as win, place, trirce, on course and off course. The big handle is on trirce off course, which is operated about 65 days a year, mainly Sundays and National Holidays. If they go into full operation at a later date, they estimate they would use a total of 240 TIMS in all and add additional capacity to the tote. The Carrus people told me that Longchamps is waiting to see how and what the results of the Vincennes tote operation show and then will decide on what procedure to take. At present the Longchamps track is using 30-year-old, Australian-totalizator equipment, this being the only tote used in France. The Carruses

have many small tracks that only race one or two days a year and any such machinery would be out of the question from a cost standpoint. They did say, however, if everything goes well, it would lead to 4 or 5 operating units in and around Paris.

As a summation, in my opinion the Swedish Computer Company has equipment and know-how to build small units of totalizators with approximately 50 to 75 TIMS capacity. I do not believe they are geared for sizable production in this field. Ericksson and Nyquist are honest and sincere engineers and, I feel, devoted to their business, but seem to be very naive with business procedures and are in dire need of a business management set-up.

A386

Direction du Pari Mutuel
30 Rue des Petits Hotels
Paris 10
Phone. Provence 07-02
Mr. Andre Carrus
Mr. Pierre Carrus
Mr. Jacues Carcus

Birj Nycuist
Hote Europe Vincennes
10 A. de Paris
Phone DAU 5353

Syn Eriksson
Spaljegatan 3
Göthorg
Phoe 400733

Swedish Computer
Box 660
Göteborg
Phone 25520
Tgr. Computer Göteborg

BEST COPY AVAILABLE

A387

Minutes of the Meeting of the
BOARD OF TRUSTEES
of
THE NEW YORK RACING ASSOCIATION INC.
Held Wednesday, June 10, 1964

A regular meeting of the Board of Trustees of The New York Racing Association Inc. was held at 10:15 A. M. on Wednesday, June 10, 1964, at 300 Park Avenue, New York, New York.

The following Trustees were present:

James C. Brady
C. T. Chenery
John W. Hanes
John A. Morris
Ogden Phipps
John M. Schiff
Alfred G. Vanderbilt
F. S. vonStade
Joseph Walker, Jr.
John Hay Whitney.

The following Trustees were absent:

G. H. Bostwick
John C. Clark
Walter D. Fletcher
John W. Galbreath
Harry F. Guggenheim
George M. Humphrey
Howell E. Jackson
Robert J. Kleberg, Jr.
Gerard S. Smith
George D. Widener

P671

Mr. James C. Brady, Chairman of the Board, presided and Mr. George J. Fritz, Secretary of the Corporation, acted as Secretary of the meeting.

The Honorable Ashley T. Cole, Chairman of the New York State Racing Commission, Thomas J. Deegan, Jr., O. Carlysle McCandless of General Counsel, Edward T. Dickinson, Frank M. Basil and Louis M. Walger, Jr. also were present by invitation.

The Chairman announced that a quorum was present and that the meeting was ready to transact business.

The Secretary then presented to the meeting a notice of the regular meeting, a copy of which had been circulated on the 22nd day of May 1964 to each of the Trustees of the Corporation.

The meeting then proceeded to the items on the agenda.

Upon motion duly made, seconded and unanimously carried, the minutes of the meeting of the Board of Trustees held on May 13, 1964 which had been circulated were approved and ordered filed with the records of the Association.

The Chairman then called for the Treasurer's report.

The Treasurer rendered his final report regarding totalisator equipment proposals. He stated that he was in receipt of an evaluation report by the Association's independent consultant, Arthur Young & Company. The Treasurer reviewed the reasons for this study and the rising cost of existing pari-mutuel operations. He recalled that a few years ago the Thoroughbred Racing Association appointed a fact finding committee to discuss costs and modernization with the American Totalisator Company.

The outcome of such discussions was that the TRA members were given alternate proposals of 5 or 10 year contracts at the then existing rates. In November 1959 the Association's Board of Trustees rejected the ten year proposal and limited the extension of the American Totalisator Company contract to a five year term. This extended term expires on December 31, 1965.

In the interim and with the advent of electronics, the Association was approached by International Business Machines to study the totalisator system. This was in 1960 and after several years they abandoned the project with the statement that a tool-up job for a complete pari-mutuel installation would be too costly and they would have a very limited market. Nevertheless, the Association did not abandon its efforts to determine whether the system presently used is the best system and the most economical.

Therefore, in 1963 other manufacturers were invited to explore the matter and they showed great interest. Proposals were received from American Totalisator Company, Automatic Totalisators Limited, Westbury Electronics, Univac and International Business Machines, which reentered the market. RCA, Burroughs, National Cash Register, Control Data and Honeywell expressed interest but decided they did not have sufficient time to develop a ticket issuing machine and declined to submit a proposal.

Mr. Basil then read the first three pages of the independent consultant's evaluation report entitled, "Evaluation of Mechanization Proposals," dated June 5, 1964. This report concluded with the recommendation that the Association accept the proposal of Automatic Totalisators Limited. The Treasurer repeated the advantages to the Association as listed by the consultant in its report.

Mr. Jack Hartzell, a managing associate in the Management Services Department of Arthur Young & Company, was then invited to enter the meeting.

Mr. Hartzell described the advantages and disadvantages of the American Totalisator Company's system and compared these with the advantages of the recommended system. He also stated his reason for not recommending Westbury Electronics, IBM and others. Mr. Hartzell then retired from the meeting.

In recognition of the importance of the proposed change in totalisator equipment, the Chairman suggested that action by the Board be deferred until each member present at the meeting may read and review the written report of the independent consultant which was distributed by the Treasurer. The Board members were encouraged to call or visit management to ask questions about the respective merits of the various proposals.

It was the sense of the meeting that it is in the best interests of the Association to make an early decision and, accordingly, on motion duly made, seconded and unanimously carried, the decision of accepting or rejecting the recommendation of the independent consultant was referred to the Executive Committee which was authorized and directed to take appropriate action after it has received the benefit of comments of individual members of the Board of Trustees.

The Treasurer then reported that the Association has accepted a commitment of the lending banks to lend the Association $34 million at any time prior to July 1, 1966 at a commitment fee of one-fourth of one percent (1/4%) per annum on the unused amount. The commitment fee is effective May 22, 1964. The rate of interest on amounts borrowed will be five and one-quarter percent (5-1/4%) per annum.

Upon motion duly made, seconded and unanimously carried, the

acceptance of the commitment of the lending banks to lend the Association $34 million at any time prior to July 1, 1966 at a commitment fee of one-fourth percent (1/4%), effective May 22, 1964, was approved, ratified and adopted.

The Treasurer then presented the operating statistics. For the first 8 days of the Belmont-at-Aqueduct meeting, attendance showed an increase of 7.7% over the same period last year. The average daily attendance for these 8 days was 32,584. The average daily handle was $3,215,127 representing an increase of 12.1% over the actual handle for the same period last year. The average daily bet per person was $98.67 compared to $94.77 or 4.1% more than last year.

The attendance for the first 74 days of racing through June 9, 1964 showed an increase of 1.9% and the handle an increase of 3.6% over the same period last year. The average daily bet per person showed an increase of 1.7%. The actual attendance for the first 74 days of racing was 2.5% over the budget and the actual handle was 3.8% over the budget. The actual daily bet per person exceeded the budget by 1.3%.

The free cash balance as of June 8, 1964 was $7,766,418 including a $2 million pari-mutuel bankroll fund at the track. The Association's short term loans of $2 million due June 14, 1964 are to be renewed on a 90 day basis.

Upon motion duly made, seconded and unanimously carried, the report of the Treasurer was accepted and approved.

The Chairman then called for the President's report.

The President reported that in 1963 the Association exceeded the amount of pumpage and limit of chlorides allowed in well water by the Water Resources Commission. In accordance with the recommendations of the Association's consulting engineers, Henderson & Casey, authorization is requested to petition the Water Resources Commission for permission to construct a new water well and a 75,000 gallon reservoir in the harrow yard at Aqueduct. The proposed work is provided for in Project #150 at an approximate cost of $98,365.

Upon motion duly made, seconded and unanimously carried, it was

> RESOLVED, That the appropriate officers of the Association be, and the same hereby are, authorized and directed to petition the Water Resources Commission for permission to sink a new well in Aqueduct's harrow yard area and to construct a 75,000 gallon concrete reservoir in the harrow yard area; and it was
>
> FURTHER RESOLVED, That Project #150 at the approximate cost of $98,365 be and the same hereby is authorized and approved.

The Chairman then stated that he has received communications from

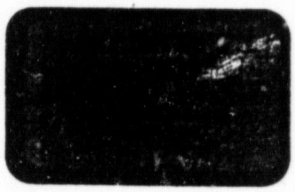
the Chairman of the State Racing Commission suggesting consideration of a New York Breeders' Award. After discussion, upon motion duly made, seconded and unanimously carried, it was

> RESOLVED, That the appropriate officers of the Association are authorized and directed to develop a New York Breeders' Award program in consultation with the New York State Racing Commission's office.

In response to an inquiry by Mr. Hanes, Mr. Dickinson reported on the status of the rehabilitation program at Saratoga. The recommendations of the Association's staff have been encompassed in the plans and drawings of the architect. The program will involve an expenditure of approximately $3,300,000. No work will be done on the clubhouse at this time. It is anticipated that invitations to bid will be sent out in June. Demolition and rebuilding will start immediately after the 1964 Saratoga meeting. The work will be completed prior to the 1965 Saratoga meeting. Arthur Froehlich and Associates are preparing a model which will be shown to the Trustees prior to the letting of contracts.

There being no further business, the meeting thereupon was adjourned.

George J. Fritz
Secretary



ARTHUR YOUNG & COMPANY

P1618

A396

ARTHUR YOUNG & COMPANY
CERTIFIED PUBLIC ACCOUNTANTS

U.S.A., CANADA, MEXICO, SOUTH AMERICA
GREAT BRITAIN, CONTINENTAL EUROPE
MIDDLE EAST, SOUTH AFRICA, AUSTRALIA

165 BROADWAY
NEW YORK, N. Y. 10006

June 5, 1964

Mr. Frank M. Basil, Vice President
The New York Racing Association, Inc.
P. O. Box 90
Ozone Park, Jamaica, New York

Dear Mr. Basil:

As you have requested, we have reviewed the manufacturers' proposals for equipment to be used in the pari-mutuel operations of The New York Racing Association. Our report comments on the present system, the major considerations involved in selecting new equipment and the relative advantages and disadvantages of each of the proposals, including a separate summary of the economic factors.

Proposals were initially submitted by American Totalisator, Automatic Totalisators; IBM and Westbury Electronic. After a preliminary review of the proposals from these manufacturers, invitations were issued to six additional manufacturers to also submit proposals; these included RCA, Burroughs, National Cash Register, Control Data, Honeywell and Univac. Because of timing considerations or other commitments, all of this latter group of manufacturers except Univac declined to submit separate proposals, although Honeywell equipment is utilized in a proposal submitted by Automatic Totalisators.

On balance, it is our belief that the Automatic Totalisators system (using Honeywell equipment) would be the most desirable from the combined standpoint of the basic system concepts and equipment, reliability of the manufacturer and overall economic factors. While there may be individual elements of the other proposals that appear more advantageous than the Automatic/Honeywell approach, this system should result in highly efficient operations for NYRA at a low level of costs.

BEST COPY AVAILABLE

While a complete comparison of the costs of all the proposed systems is shown in attached schedules, a brief summary of the costs of the Automatic/Honeywell system is given in the following table:

Automatic/Honeywell System Costs

Purchased equipment:	
550 TIM's and Interface	$3,162,000
Installation costs:	
Aqueduct	300,000
Belmont (*)	300,000
Saratoga	240,000
Total purchase cost	$4,002,000
Recurring annual costs:	
Rental of three computers	$ 213,000
Maintenance and service	425,000
Supplies	144,000
	782,000
Less reductions in annual personnel and equipment costs	161,000
Total annual costs	$ 621,000

(*) Would be required in any event due to demolition of Belmont grandstand.

The major rationale behind our recommendation is described in the attached report that is divided into the following sections:

I THE PRESENT SYSTEM

II GENERAL COMMENTS ON BASIC REQUIREMENTS AND THE PROPOSALS

III ADVANTAGES AND DISADVANTAGES OF EACH SYSTEM

IV SUMMARY COMPARISON OF CASH FLOW

V SUMMARY OF SYSTEMS' COSTS

VI CASH FLOW EFFECT BY YEARS FOR EACH PROPOSAL

In summary, we should note that the NYRA racing operations demand very high levels of performance and reliability for the total operating system. Improvements over the present system that will mechanize more of the operations are practicable and economically feasible. Application of any new and untried system involves risk, however, and unlike most other applications, there will be virtually no opportunity to operate a new system in parallel with the old during the period when the new system is being thoroughly checked out. Each of the proposed systems involves some new features or equipment which has not yet been developed.

In view of the rigorous requirements, we would recommend consideration first of those systems with the most well-known and proven components. On this basis, the number of contenders would be reduced to Univac/American, Automatic/Honeywell and IBM in the computerized systems (the central equipment used by Westbury is relatively unknown). We believe that real-time computer systems have now been proved sufficiently reliable to preclude consideration of the electro-mechanical totes. The untried IBM ticket machine and the lower level of maintenance offered for operations make this proposal less attractive than the other two.

Between Univac/American and Automatic/Honeywell, we feel that the systems approach of Automatic/Honeywell is better. This is based upon the use of three, instead of two, computers and the design of the interface between the TIMs and computers. Although there are clear advantages and disadvantages to each of these systems, and while both are well adapted to the NYRA applications, the economic advantage is clearly with Automatic/Honeywell.

All of these factors are discussed in further detail in the attached report. After you have had an opportunity to review this material, we will be glad to answer any questions that you may have and to assist you with the program in any manner you wish.

Yours very truly,

Arthur Young & Company

EVALUATION OF MECHANIZATION PROPOSALS
for
THE NEW YORK RACING ASSOCIATION, INC.

I. THE PRESENT SYSTEM

Your present system has a number of limitations which result in manual operations, and involve substantial risks. The design of much of the present system is outmoded, in that alterations to make it more automatic become cumbersome. The system appears to be expensive relative to alternative systems. Also, your present contract will expire in the time that would be required to implement another manufacturer's system.

This year, the total handle of the NYRA tracks is expected to be $656 million over a 234 day season. Operation normally will involve rotation among Aqueduct, Belmont and Saratoga tracks, with a total of six moves per season. The present system is owned and leased to NYRA by American Totalisator Company. The charges to NYRA for the system this year are budgeted at $1,450,000.

In the present system, the daily double operation is completely manual. Sheets printed at each doubles ticket issuing machine (referred to as DIM) are manually removed and transported by pneumatic tube to the calculating room. There they are summarized, and odds and prices computed manually. This degree of human intervention, under time pressure, involves an inordinate risk of error. There is also a tendency to discontinue doubles betting earlier than it might be stopped under an automated system. These DIMs are charged at the rate of $8 per day each, in addition to regular charges, and cannot be operated as regular ticket issuing machines (referred to as TIM).

Another limitation to the present system is need for selling-line supervisors to spend 15-20 per cent of their time in non-selling functions. This time is used chiefly in replacing ticket paper in the TIMs, which they supervise. Of course, selling time is also lost on the machine requiring

attention. Any new system should use sufficiently large ticket rolls to reduce the supervisors' non-productive time to about 5 per cent.

Still another major limitation of the present system is the requirement for manual re-buying of advance sale tickets. The volume of these tickets is not large, but sufficient risk is involved to require considerable manual checking.

The present totalisator central equipment is electro-mechanical in nature. Thus, it is similar in many ways to some telephone central office equipment. It has been developed to a high degree of reliability, but it is slow and inflexible. As a result, the totalisator has a built-in program and can be used only for the purpose for which it was designed. This equipment, and the computers proposed for use with it, cannot perform accounting and other functions now done by the IBM 1401, nor can they produce a machinable input for the 1401. Thus, any data that could be captured during racing operations for later processing must now be re-entered manually.

The lack of general-purpose computing facilities in the present system would require major changes to achieve higher levels of automation. Higher levels which other systems will probably reach over the next few years include machine validation of winning tickets, and, beyond this, machine cashing. American Totalisator Company evidences no research and development efforts in these areas now. They are merely continuing to make patchwork type improvements to overcome some of the present limitations.

II. GENERAL COMMENTS ON BASIC REQUIREMENTS AND THE PROPOSALS

Many of the proposals included a number of alternatives with regard to purchase or lease options. In the financial schedules we have used the option of leasing the central equipment and purchasing the remainder where this option is offered. We believe that leasing of computers is preferable because of the obsolescence factor. This is particularly true in view of the possibility of going to machine validation of winning tickets in the future. This would probably require larger and faster computers. Consideration should also be given to the convertability of the TIMs to machine validation, and also the updating of TIMs with improvements under a purchase option. In the Westbury proposal, no direct purchase option is offered except in participation in joint ownership of a separate company where contracts with NYRA, Westbury, Yonkers, etc. would be the vehicle for expanding service to other tracks. We have no knowledge of the legal status of this proposal.

Only one manufacturer, IBM, proposed a validation system as an alternative. However, to upgrade from the proposed IBM Sell system to validation would require an investment of about $1.6 million plus roughly $360,000 additional annual charges. The savings in personnel costs to offset these mechanization costs is around $100,000 per year. Clearly, a more economical approach to validation would have to be developed to become feasible.

The proposals varied also in the means of operating alternatively at three different tracks. The Westbury Electronic approach is to use duplicated transmission lines over different routes. The IBM approach is to simply move the two central computers. The Automatic/Honeywell approach is to have a third computer to be used normally to process the work now done on the 1401. Preceding a move, however, this machine would move to the next site of operations in sufficient time to assure that it would be operational when betting begins. We believe this is the best approach.

Another variation in the systems is the type of takeoff to be used. These varied from point-of-sale takeoffs in printed form, magnetic tape or punched paper tape to a central takeoff only. Both the point-of-sale printed takeoff of American Totalisator and the IBM and Automatic/Honewell central takeoff concept should give completely satisfactory results. An extra safety factor would be provided with an on-line emergency power supply for the central takeoff systems, and with duplicated (and, in the case of Automatic/Honeywell, triplicated) computers, the probability of a complete system loss is extremely remote.

All of the systems proposed include provisions to overcome the present operating limitations. Beyond this, the basic differences in the proposals are the types of TIMs and the use of general-purpose electronic computers, as opposed to electromechanical totalisators. The basic advantages of computerized systems lie in the inherent flexibility of stored program machines. The functions which these machines will perform can be changed by merely writing a new program or altering an existing program. Thus, for example, it is a relatively simple matter to include additional checking routines into a system when desirable. If an error is detected in a system by the machine (the machines are self-checking in their own operations), it can go immediately to corrective routines. An example of this would be falling back automatically to a duplicate set of equipment on detection of an error. This is faster and surer than with the human intervention required by the electromechanical equipment.

Electronic equipment is extremely fast and can usually absorb normal rates of growth in volumes for many years without enlarging the equipment. General-purpose computers also can be supplemented by peripheral units, including magnetic tape drives, random access memory devices and data input readers such as document scanners or readers of punched input documents. Combinations of these devices will be required to attain machine validation and cashing.

Another component, which is of prime importance in the proposed systems, is the ticket issuing machine to be used. The machines included in the proposals are the presently installed American Totalisator model, a new improved model of the widely used Automatic Totalisator machine, and an untried IBM prototype machine. The TIM is of such key importance that all companies invited to bid, which did not have at least a prototype TIM, declined to bid as prime contractors. Those companies that declined to bid indicated that they felt the expense would be too great, or the time insufficient, to develop a reliable TIM.

III. ADVANTAGES AND DISADVANTAGES OF EACH SYSTEM

American Totalisator Company - Electromechanical central

The major advantages of this proposed American Totalisator system are:

1. Many years of experience with this equipment has shown a high degree of reliability.
2. The equipment is in sufficiently wide use to provide a pool of back-up equipment. If any of the equipment is out of service, it can be replaced on short notice.
3. The company operates all equipment except ticket issuers and accepts responsibility for all operating errors, except those of the sellers and cashiers.
4. TIMs and DIMs each produce a printed take-off, which can be used for checking, balancing and error tracing. It has the distinct advantage of being readable without additional processing.

The major disadvantages of this proposed American Totalisator system are:

1. Although a high level of service has been performed, it is expensive relative to the other systems.
2. The system requires a high degree of human intervention both in correcting errors and in fallback to standby equipment.

3. It uses special purpose computers which will not replace the IBM 1401, and precludes integrated data processing.

4. The system is inflexible, and offers less mechanized checking than the electronic systems.

5. Doubles issuing machines (DIMs) cannot be used as regular ticket issuing machines (TIMs). This inflexibility results in a need for more machines and more moving and interchanging of machines.

6. The manufacturer states it is their belief that machine validation is still far in the future. No evidence is offered of work being done to develop more automated systems. The type of system improvements offered make no indication of an early abandonment of the electromechanical tote in favor of newer electronic techniques.

Univac/American Totalisator Company

This proposal was submitted by Univac, but is in fact a joint proposal with American Totalisator Company. Under the terms of this proposal, American Totalisator would be the prime contractor, with Univac merely supplying the computers and communications interface equipment. American Totalisator would assume complete responsibility for operation and maintenance of the entire system.

The major advantages of the system proposed by Univac are:

1. The system would use the American Totalisator TIMs and DIMs. Experience has shown these units to be reliable. Further, each of the other advantages listed for the American Totalisator system would be equally applicable in this system.

2. The electromechanical central with its various peripheral special purpose computers would be replaced by duplicated general purpose electronic computers and communications gear.

3. The computers proposed in this system have a record of high reliability and are well adapted with regard to speed and other capabilities to this application. These machines would provide a basis for integrated data processing and higher levels of automation. The separate IBM 1401 installation would be eliminated.

The major disadvantages of the system proposed by Univac are:

1. The principal disadvantage of this system is its cost relative to other systems. The computer rentals are reasonable, but the purchase price of the American Totalisator equipment seems excessive. This is particularly true because the equipment being offered is used, and may be up to two years old.

2. DIMs cannot be used as TIMs.

Automatic Totalisators/Honeywell

In this proposal by Automatic Totalisators, a new improved model of their TIM would be connected to conventional Honeywell computers through a link to be developed by Data Trends, Incorporated. Automatic Totalisators would be the prime contractor for the entire system and its operation.

The major advantages of this system are:

1. The system incorporates the latest in electronic data processing and communications techniques.

2. General purpose computing facilities would:
   a. Permit programmed checking.
   b. Provide program controlled fall-back with very little human intervention.
   c. Eliminate the need for the IBM 1401 installation.
   d. Permit integrated data processing.
   e. Provide extensive software for routine data processing.
   f. Offer flexibility for future growth.

3. The proposed alternative to use three computers offers the following advantages:
   a. The third computer can be used to do the processing now done by the IBM 1401 without resorting to off hours, as well as being back-up for the two on-line machines.
   b. When moving from one track to another the third unit could proceed to the next location several days in advance of the actual move. This would add assurance that operations could begin on schedule in the new location.

4. The system proposes to use an improved model of the Automatic Totalisator TIM. The basic unit is widely used and has an established level of reliability.

5. The prime contractor will accept responsibility for all systems operations similar to American Totalisator.

The major disadvantages of the Automatic Totalisator/ Honeywell system are:

1. The dependence upon three manufacturers, with one being the prime contractor. However, the prime contractor proposes to accept full financial and operational responsibility for the system.

2. No point-of-sale takeoff is available. With the checking capability and other features inherent in the system's design, a point-of-sale takeoff would not be required unless all of the central computers were down simultaneously.

The IBM System

The major advantages of the IBM system are:

1. The system incorporates the latest in electronic data processing and communications techniques. The company manufactures a wide variety of products, some of which may be useful in going to higher levels of automation. IBM is now offering a proposed system which includes machine validation of winning tickets. The products are backed by vast research and development efforts.

2. General purpose computing facilities would:
   a. Permit programmed checking.
   b. Provide program controlled fall-back with very little human intervention.
   c. Eliminate the need for the IBM 1401 installation.
   d. Permit integrated data processing.
   e. Provide extensive software for routine data processing.
   f. Offer flexibility for future growth.

The major disadvantages of the proposed IBM system are:

1. From a technical standpoint, the system utilizes untried ticket issuing machines. In addition to being untried, no provision is made for point-of-sale takeoff. There is only a single register showing the total number of tickets sold. Complete reliance must be placed on a central takeoff.

2. IBM does not plan to have at least one maintenance man present on each selling line as do all of the other manufacturers. IBM contemplates having about fifteen men to do the complete maintenance job. It is not possible to forecast the failure rate of the IBM ticket issuers, but this level of maintenance (approximately half the number of personnel used in the present system or proposed by other manufacturers) seems inadequate.

Westbury Electronic Corporation

The major advantages of the proposed Westbury Electronic System are:

1. This system is much like the IBM, Univac and Automatic systems in that the central is all electronic. It also includes general purpose computing facilities.

2. The system uses a model of Automatic Totalisators issuing machines which has been modified to gain a substantial improvement in speed of operation.

3. DIMs can be used as TIMs.

4. The system can grow into mechanized validation. A validating machine is now in development and there appears to be an adequate research and development effort in the organization.

5. Fall-back to standby equipment is under program control.

6. The central processors do not have to be moved.

7. The manufacturer would accept responsibility for operating losses as American Totalisator does now.

The major disadvantages of the proposed Westbury Electronic system are:

1. The computers used in this system are not in use elsewhere. Thus, many characteristics, particularly reliability, of the units are not known.

2. The point-of-sale takeoff is in the form of magnetic tape. There is some potential disadvantage that in the event of breakdown, these would have to be gathered and read through a tape reader. Although the tapes are read backward (the last race first), this could be a time consuming operation.

3. Data would be transmitted over two lines covering different routes, but the loss of both lines remains a possibility.

BEST COPY AVAILABLE

NEW YORK

IV. SUMMARY C

(0

Year ending	Automatic/ Honeywell (purchase with computer rental)	IBM		
		Sell/ system total rental exc. display	Sell/ system (purchase with computer rental)	Sell/ validate system (purchase with computer rental)
Feb.28,1966(a)	$ (123)	$ 1	$(122)	$ (157)
Feb.28,1967	88	(41)	(25)	(349)
Feb.29,1968	(11)	(70)	(144)	(508)
Feb.28,1969	(81)	(89)	(228)	(620)
Feb.28,1970	(129)	(103)	(285)	(696)
Feb.28,1971(b)	(160)	(112)	(323)	(743)
Feb.29,1972	583	99	564	437
Feb.28,1973	583	98	564	437
Feb.28,1974	583	98	564	437
Total	$1,333	$(119)	$ 565	$(1,762)
Years after Feb.28,1974	$ 431	$ 56	$ 383	$ 196

(a) Last year under present s

(b) Purchase loan repayment c

(*) Contract offered only for
known beyond this point

RACING ASSOCIATION

OMPARISON OF CASH FLOW

00 omitted)

Univac/ American (purchase with computer rental)	Westbury Electronic (rental only)	American Totalisator			
		Total rental	Total purchase	Combined purchase and rental	Service contract
$ (152)	$ -	$(52)	$ (664)	$ (551)	$ (52)
(452)	306	69	(346)	(301)	(84)
(584)	306	58	(505)	(433)	(77)
(677)	306	49	(617)	(525)	(85)
(740)	306	43	(692)	(588)	(91)
(781)	306	39	(739)	(631)	(95)
203	306(*)	132	438	349	(2)
203	306(*)	132	438	349	(3)
203	306(*)	132	438	349	(3)
$(2,777)	$2,448	$602	$(2,249)	$(1,982)	$(472)
$ 2	$ 306	$113	$ 197	$ 149	$ (21)

ystem.

ompleted at end of the fifth year..

a 5 year period, with costs not

NEW YORK RACING ASSOCIATION

V. SUMMARY OF SYSTEMS' COSTS

(000 omitted)

	IBM					American Totalisator			
	Automatic/ Honeywell purchase with computer rental	Sell system total rental exc. display	Sell system purchase with computer rental	Sell/ validate system purchase with computer rental	Univac/ American purchase with computer rental	Westbury Electronic rental only	Total rental	Total purchase	Combined purchase and rental	Service contract
Purchased equipment:										
Ticket issuing machines and interface	$3,162	$ 382	$4,020	$5,620	$4,806	$ -	$ -	$5,850	$4,771	$ -
Installation costs:										
Aqueduct	300	279	279	279	-	-	-	-	-	-
Belmont(*)	300	250	250	250	500	-	500	500	500	500
Saratoga	240	223	223	223	-	-	-	-	-	-
Total purchase cost	$4,002	$1,134	$4,772	$6,372	$5,306	$ -	$ 500	$6,350	$5,271	$ 500
Recurring annual costs:										
Rental of computers and/or other equipments	$ 213	$1,021	$ 392	$ 687	$ 420					
Maintenance and service	425	339	339	504	1,188					
Supplies	144	144	144	144	-					
	782	1,504	875	1,335	1,608	$1,022	$1,307	$1,[illegible]	$1,238	$1,565
Less reductions in annual personnel and equipment costs	161	161	161	261	161	161	74	74	[illegible]	74
Total annual costs	$ 621	$1,343	$ 714	$1,074	$1,447	$ 861	$1,233	$1,072	$1,164	$1,491

(*) Would be required in any event due to demolition of Belmont grandstand.

VI. CASH FLOW EFFECT BY YEARS FOR EACH PROPOSAL

A411

Automatic Totalisators Inc.

WORLDWIDE

AUSTRALIA
BRAZIL
BURMA
CANADA
CEYLON
COLOMBIA
ENGLAND
FRANCE
GHANA
HONG KONG
INDIA
INDONESIA
IRAQ
IRELAND
JAMAICA
MALAYSIA
NEW ZEALAND
NIGERIA
PAKISTAN
PHILIPPINE ISLANDS
RHODESIA
SCOTLAND
SOUTH AFRICA
SPAIN
SWEDEN
THAILAND
TRINIDAD
UNITED STATES
VENEZUELA

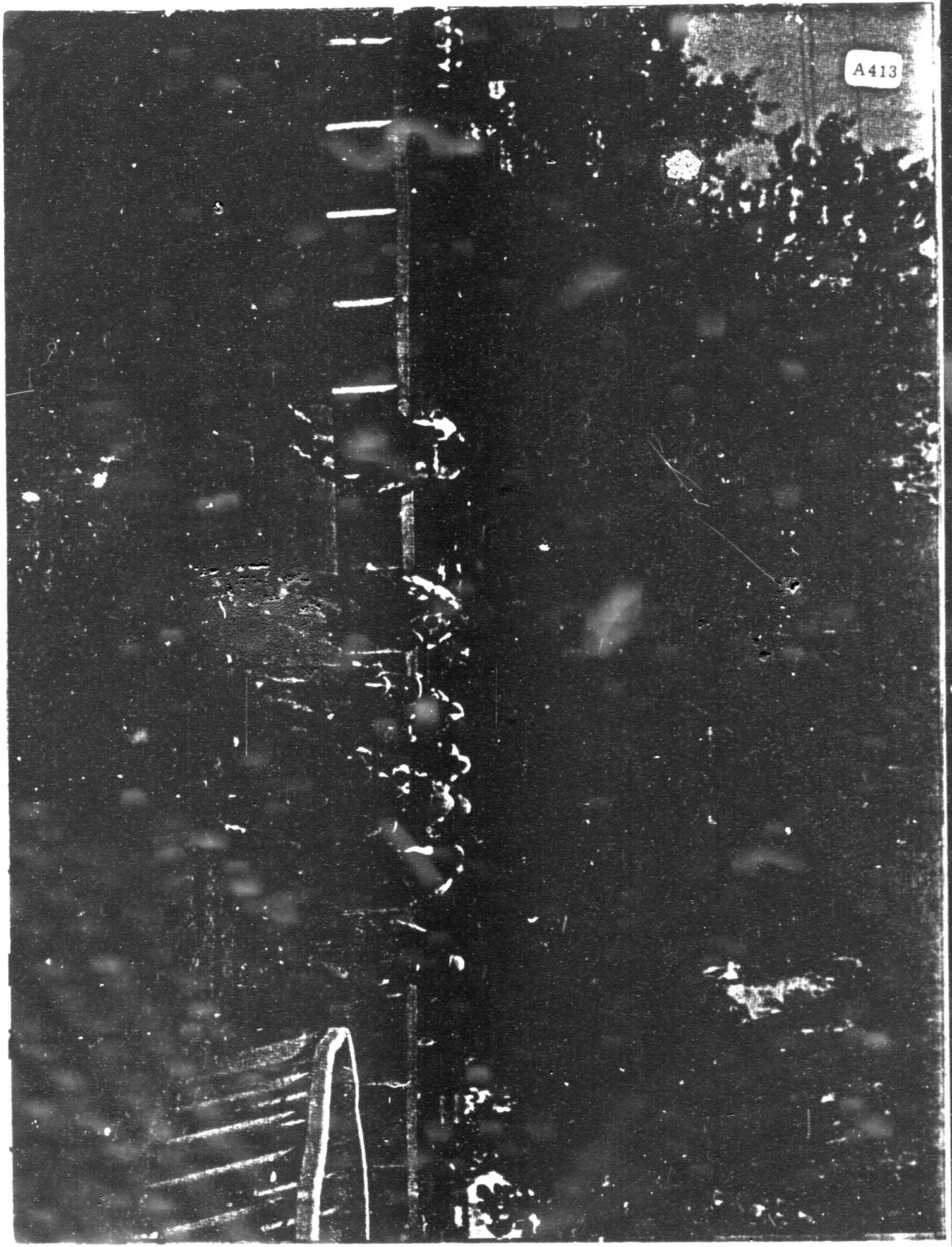
ATI

A412

Automatic Totalisators invented the totalisator, coined the word itself, and has provided every major new development in totalisator equipment since the first mechanical ticketing device.

Today in 29 countries around the world, Automatic Totalisators leads the field in service and innovations which benefit the racing fan and the racing industry.

The experience, product superiority and know how of Automatic Totalisators has resulted in faster, more efficient and more profitable mutuel operations for A.T.I. customers.

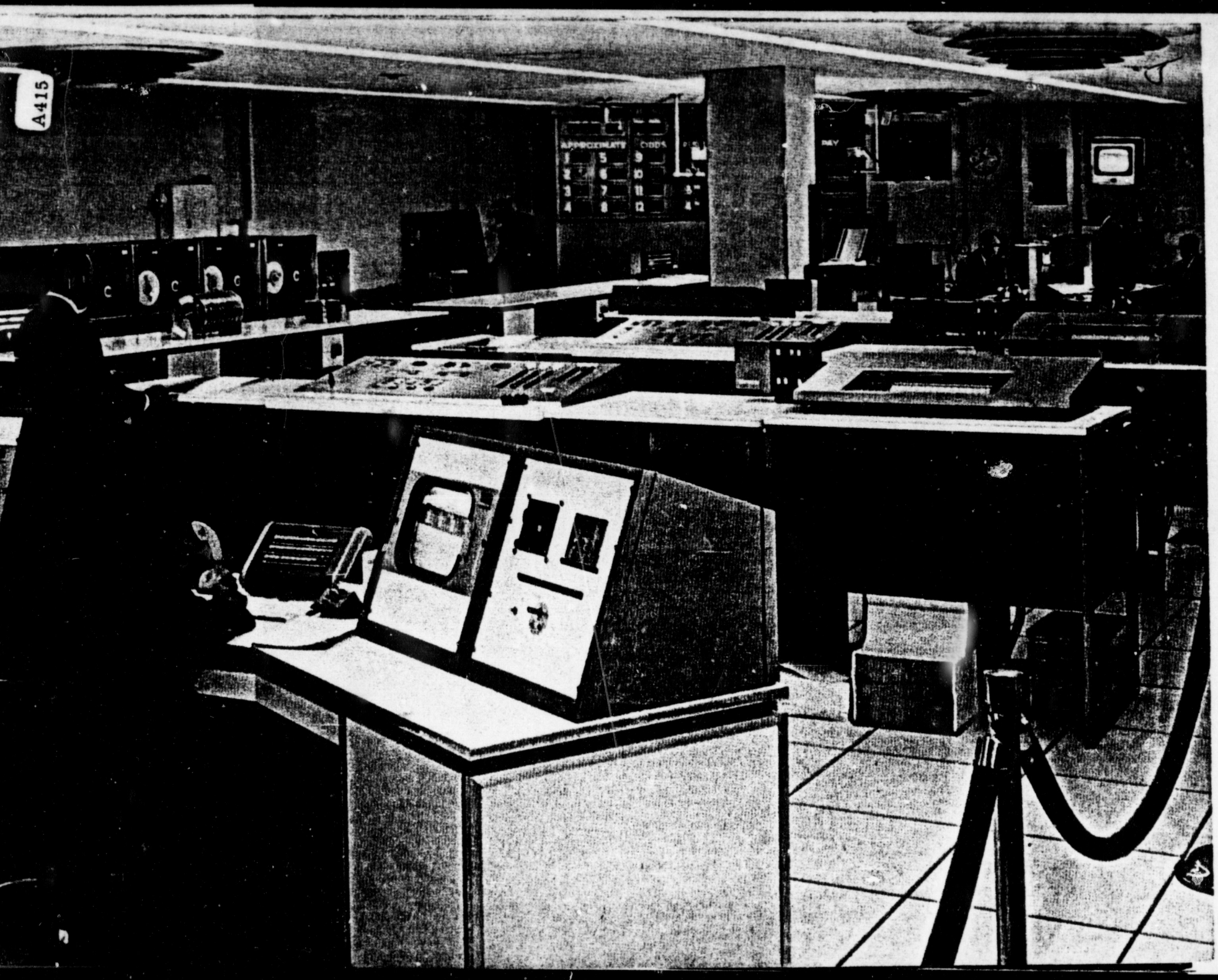

A413

First in its field

Automatic Totalisators occupies a unique position in its field. During its history, dating back more than half a century, it has—

- ☐ invented the totalisator,
- ☐ designed, installed and operated New York's Aqueduct, Belmont and Saratoga system, the highest dollar volume totalisator system in the world,
- ☐ designed and installed Hong Kong's Happy Valley system, the largest totalisator system in the world,
- ☐ developed an international organization with more employees and greater production capacity than any other totalisator company in the world, and
- ☐ assembled a highly sophisticated and productive research and development division that has accounted for every major development in totalisators since the concept of the tote itself.

Automatic Totalisators Inc. has effected far reaching changes in the racing industry, and will continue to lead the way for others to follow.


A415

6

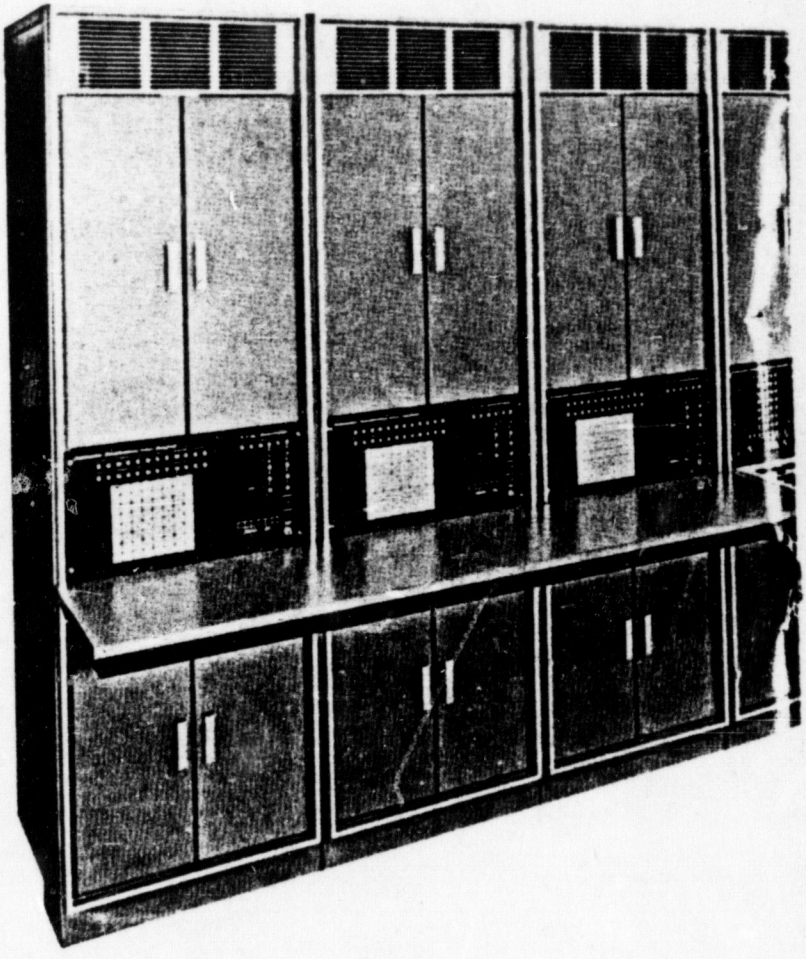
The evolution of A.T.I. equipment

In 1913 an Australian inventor named Sir George Julius developed the first practical mechanical totalisator. It was called the Julius Premier Totalisator. Its second and third generation counterparts were to gain renown throughout the world as the Australian Tote.

Originally conceived as a mechanical vote counting device, Sir George quickly recognized its application to racing. A company was formed and the new word "totalisator" was coined for use in the firm name.

That word has since become generic, appearing today in dictionaries to describe mutuels equipment of any manufacture.

Automatic Totalisators put its first mechanical tote into operation in 1917, and three years later unveiled the first electro-mechanical tote, a concept still used in many tote systems today. The first multiple pool machine was introduced in 1923, and the first automatic odds in 1927, both by Automatic Totalisators.



A417

These developments enabled the international racing industry to grow at the pace it did. By the early 1950's, straining at its seams and demanding new and faster totalisator services, the industry continued to be led by Automatic Totalisators introduction of new developments. The first Quiniela equipment, the first four-way selling equipment, the first automatic doubles equipment, and the first electronic totalisator system, all were developed and implemented by Automatic Totalisators.

Quickly recognizing the potential of computers for the pari-mutuel industry, A.T.I. installed its first computerized totalisator system at the world's largest pari-mutuel operation, the tracks of the New York Racing Association. The impact of this 1965 installation was comparable to that of the electro-mechanical introduction forty-five years earlier. The experience and success achieved by A.T.I. at the N.Y.R.A. tracks led to the introduction of a streamlined, simplified system for universal application. The computerized tote had come of age.

A418

The evolution of A.T.I. operations

Automatic Totalisators' first U.S. installation was at Hialeah in 1932. A year later that system was sold as part of a five year franchise to businessmen who later formed the American Totalisator Company. Expiration of the franchise found Automatic Tote fully involved in the production of high precision, high reliability defense products.

In the late 1940's, following its return to peacetime production, A.T.I. operations opened in Florida, Ohio, Kentucky and Massachusetts, and the years that followed bore witness to further expansion throughout the United States and Canada.

It was during this period of growth that a dynamic corporate organization evolved. United States management and operating staff were expanded and strengthened by experts in electronics as well as mutuels. Research, development and manufacturing facilities were enlarged: full scale domestic operations were underway.

In 1965 Automatic Totalisators was selected to install its revolutionary computerized system in the massive operations of the New York Racing Association. Aqueduct, Belmont and Saratoga—well known names in U.S. racing —now sported the latest in totalisator technology, A.T.I.'s computerized system.

Recognizing the New York system as not economically suited to all other tracks, A.T.I. used its technology and

A419

experience to produce a streamlined version of that system. This new system was unveiled in 1967 at industry conventions in Boston, New York and Nassau. Almost simultaneously, A.T.I. installations were seen around the nation, as track after track recognized the value of this new system.

While A.T.I. was growing in the U.S., its parent company was enjoying equally impressive growth around the world. London . . . Paris . . . Athens . . . Bangkok . . . Hong Kong . . . from South Africa to New Zealand, every continent in the world that has pari-mutuel racing has Automatic Totalisators.

This international structure is an important factor in totalisator service. A problem at a track in Miami may well have been encountered previously in Rio de Janeiro. An improvement in the operating procedures in Singapore may have application in Cleveland as well. The cross-pollination of ideas by men handling similar problems in different nations benefits A.T.I. customers everywhere.

On that note the A.T.I. story is brought up to date—on one hand a U.S. company with full service, distribution, manufacturing and research and development facilities, and on the other hand a worldwide, closely integrated organization with all of the resources and expertise that "worldwide" suggests.

A 420

A421

Why tracks have changed to A.T.I.

Less widely publicized than the operations at New York Racing Association tracks are A.T.I. installations in Florida, Ohio, Massachusetts, Rhode Island, New Hampshire, Colorado, Pennsylvania, South Dakota, Arkansas, Michigan, Louisiana and Delaware. Thoroughbreds, standardbreds, greyhounds, quarterhorses, and jai alai—A.T.I. serves them all.

Historic racing sites such as Narragansett Park, imaginative new plants such as Dover Downs, colorful locations such as Rocky Mountain Kennel Club—customers ranging from industry giants to state fairs share a common reason for turning to Automatic Totalisators: a combination of service, system flexibility and increased track profits.

Many U.S. tracks which had previously used other systems and equipment have changed to A.T.I. Without exception they have found that A.T.I. offers newer and more effective ways of doing business. Their findings are supported—

☐ by the succession of A.T.I. innovations and by the benefits these innovations have brought to racing,

☐ by the A.T.I. warranty which "unconditionally guarantees the odds and payout amounts posted by the system,"

☐ by an entirely new area of service—the use of A.T.I. computers for non-betting operations such as sheetwriting and payroll,

☐ by A.T.I.'s years of experience in installing and operating electronic systems, and its impressive record of success with its personnel and equipment in totalisator operations,

☐ by A.T.I.'s unique labor flexibility, through an international labor agreement permitting free choice in the use of either local electricians or trained personnel from other areas, or both.

documented reductions in operating costs, and
increased track profits.

the New York Racing Association alone, A.T.I.
pment has handled several billions of dollars in
t sales, to the complete satisfaction of its customers.
ther companies enter the field of electronic betting
ems, Automatic Totalisators stands securely on its
olished record, as first in the field.

nge: Necessary for progress

mpetition for the consumers' dollar becomes
er, as management sees rising costs without
sponding increases in handle, and as the racing
try becomes increasingly aware of the need for
ge, A.T.I. will continue making those changes
ible.

roughout its history, A.T.I. has been oriented toward
ge. A decade ago it recognized the changes
ible through electronics and computers, and
eered the field. As revolutionary as they are, the
ges made by A.T.I. are only the beginning; the
ntial of computerized operations has barely
tapped.

T.I. Research and Development teams are now at
on new projects which will make even more
ovements in track operations possible.

T.I. has recognized the needs of the industry and
onded.

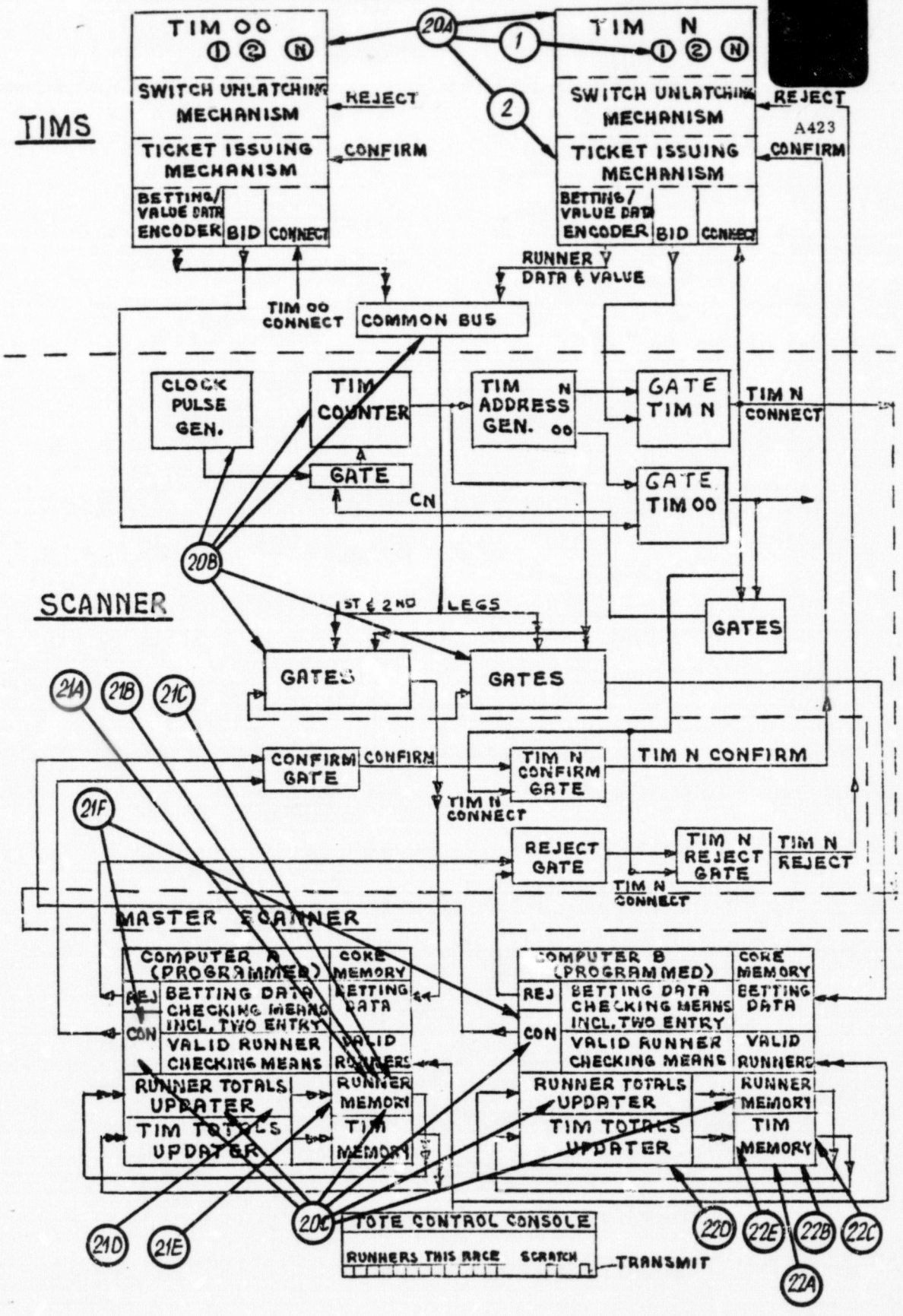
is cycle of response and innovation will continue.

Automatic Totalisators Inc.

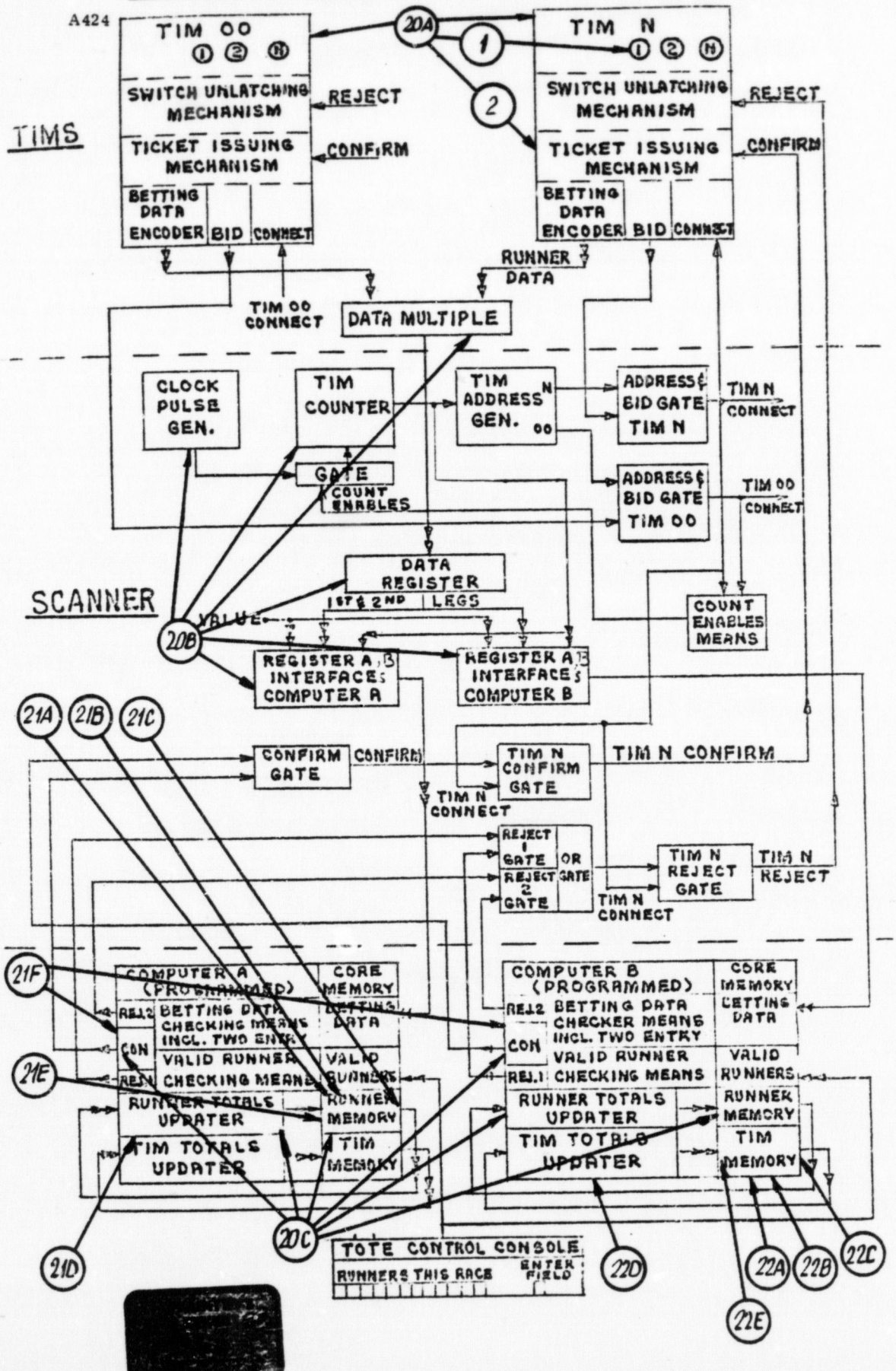
WORLDWIDE

A422

NYRA ELECTRONIC TOTALISATOR SYSTEM



PDP-8 ELECTRONIC TOTALISATOR SYSTEM



Universal Controls, Inc.

Annual Report
March 31, 1962

American Totalisator Co. Division

During the fiscal year ended March 31, 1962, racing as a whole continued to exhibit the vitality and steady pattern of growth revealed in our previous reports. Attendance rose to a new high of over 58 million, while the mutuel handle likewise reached a record-breaking figure of 3.98 billion dollars. Although legal actions prevented the state of Pennsylvania from being added to the roster of 25 states which received more than 275 million dollars in tax and license revenues from racing during 1961, these obstacles have been overcome and two tracks will open there in 1963.

The addition of six new operations and the growth of others during the past year has required an increase in our operating equipment of more than 10%. To provide service to our customers, whose locations ran from coast to coast in the United States, and Canada, as well as in Mexico and Puerto Rico, our Company trucks travelled over 330,000 miles. At the same time, our operating personnel moved more than 1,500,000 miles.

Contrary to a wide-spread impression, the American Totalisator Company has always operated in a competitive market. At the time of the first American Totalisator Company installation at Arlington Park, Chicago, in 1933, a major American race track had already had a year's operation with another design. In the succeeding years, several other totalisator systems were designed and installed by competing companies. However, the American Totalisator Company has consistently led the way in introducing new equipment to give better, faster, and more accurate service. The Arlington Park installation was the first all-electric totalisator, and the first with a public display of the betting figures which were accurate to the dollar. A quick succession of designs provided equipment for all segments of the industry, whose rapid growth it had stimulated, from the smallest tracks to the largest.

The American Totalisator Company introduced its Electronic Odds Computer shortly after the birth of the electronic era, while the ENIAC, the first large-scale electronic computer, was still a novelty. This Electronic Odds Computer provided a new line of odds automatically with each change of the totalisator betting figures, with a speed and accuracy still unmatched.

As early as 1945, the Company designed and field-tested an electronic totalisator. Despite the optimistic claims of the electronic engineers, and the real success of electronic computers operated in laboratory-type surroundings, the electronic totalisator was speedily proven to be unsuited to the harsh climate of the racetrack. Its sensitivity and complicated design, with the extended periods of "down-time" which plagues even current computers, could not meet the race-track requirement for continuous dependability and maximum accuracy.

The American Totalisator Company has continued to follow the progress of electronic and computer technology, and its equipment today represents a balanced application of electric and electronic techniques. The totalisator equipment proper, which must function with unfailing dependability, is composed of rugged, reliable, electrical units manufactured by our subsidiary, C. P. Clare & Co. This equipment, although moved perhaps thousands of miles during an operating season, routinely handles crowds of sixty or seventy thousand people, and a betting handle of over 5 million dollars in 8 races with complete satisfaction to all.

The auxiliary services, such as automatic odds and pay-off computations as distinguished from the totalisator proper, are provided by specialized electronic computers. The pay-off computer, called Compu-Tote, is a solid-state electronic computer provided with a unique programming system originated and designed by our Research and Development Department. The Compu-Tote automatically calculates the proper pay-off values, for tickets of all denominations, for more than 25 combinations of finishes, including triple dead heats. The Compu-Tote is being widely used this season at such major race tracks as Aqueduct, Roosevelt Raceway, Santa Anita and Hollywood Park.

From its inception, the American Totalisator Company has always guaranteed the complete accuracy of its figures, and made good any errors. Although properly designed equipment is essential to any system, the service organization behind the machine is of major importance in so complex an operation as that of the totalisator. With nearly 30 years of operating experience incorporated in its service organization, the American Totalisator Company is well equipped to maintain its leadership in the totalisator field.

BEST COPY AVAILABLE

P123

A426

The Farm
Box 418, Walden, N.Y.
PRescott 4-1233

July 10, 1960

Mr. George M. Levy
Roosevelt Raceway
Westbury, Long Island

Dear Mr. Levy:

It was generous of you to sit patiently through our five-hour meeting on Friday, July 8th.

You are a man who gained my respect many years ago, but rather than see you subject yourself to the hazards of a fully electronic totalizator, I plead with you now -- forget that you ever heard of Western Totalizator Company and Digitronics, and continue with American Totalizator Company. Your remarkable success in the difficult harness field has brought you notable fame. Don't attempt at this stage of your life to get involved in any scheme that could wipe out everything you have built up through many years of hard work. Your organization can enjoy a tremendous economy by remaining close to the proven, practical methods of totalizator installation. Deviating too far from this proven path can only result in complete chaos and embarrassment that you will never live down. If this should happen, I think I would feel worse than you would.

I want to thank you for allowing me to read the presentation made by Digitronics describing their fully electronic totalizator. I appreciate that the gentlemen we met at your office who are associated with Digitronics are entitled to their convictions and I don't think I or anyone else has the right to present arguments, reasons or facts that would tend to destroy, hinder or affect their creative ideas with regard to a fully electronic totalizator. Because of this feeling, I was most reluctant to point out the <u>numerous</u> phases of the impracticability of their electronic totalizator. However, I do feel obliged to make the following comments to you, which of course is at a different level than at the meeting. They are so far away from having an economical, workable totalizator that it is downright pathetic. They have violated every rule in the book that insures the continuity of performance of a successful totalizator installation.

During our lunch at Longchamps, I stated emphatically that an electronically-minded man would have a natural tendency to condense into one channel what American Totalizator and Ericson Totalizator would do in 16 or 17 channels. Neither Ericson, Bell Punch nor American Totalizator employ 16 or 17 channels out of necessity. They do it to insure continuity of performance. Every totalizator company could condense all its channels into one or two groups and, naturally, this would be a tremendous saving. However, the toll for the deletion of these channels would be to present the hazardous possibility of failure; in other words, giving up the assurance of continuity of performance to save on

2
P216

equipment costs. I don't know of any better way for a man to put himself out of the totalizator business than to try to economize by surrendering the assurance of performance.

At our meeting, the Digitronics gentlemen stated that they were applying a new electronic technique known to the industry as a solid-state application. Solid state electronic equipment means only that they have substituted newly invented, inexpensive transistors, diodes, ferractors and printed circuits in place of vacuum valves. By using these newly invented components, electronic equipment can be made much smaller and less expensive. The application of what is referred to by the Digitronics gentlemen as a new technique is comparatively true since the electronic industry has only accepted these components within the last two years. This phase of their technique, however, is not original so far as Digitronics is concerned.

Western had numerous conferences with Lan Anderson, Technical Adviser to the Executive Vice President of Remington Rand Corporation, concerning part of the technique that the Digitronics men referred to. The solid state technique that they are incorporating in their electronic totalizator has been discussed and discarded by men of the highest standing in the electronic field, that is, so far as application to a totalizator is concerned. Western has thoroughly investigated with Mr. Anderson the possibility of electronic equipment and after several months of extensive investigation, we established that to maintain speed, accuracy and economy, the cost for this central electronic equipment would be prohibitive.

The Race Course Control Betting Board of England established some 25 years ago that no totalizator equipment would be acceptable unless each wager was recorded before the ticket was issued. This method of registration has been accepted by most of the State Racing Commissions and is also a mandatory part of the totalizator regulations in Canada. This phase of the totalizator operation is accomplished by means of a "Return Impulse". I have scanned the Digitronics presentation and I find no mention of this R.I. feature vitally necessary to totalizator equipment. American Totalizator accomplished this feature by means of a straight line or a parallel circuit. Ericson established the same feature by the same method. This phase of the operation is where Lan Anderson and our engineers ran into difficulty with the electronic equipment. The R.I. aspect of a totalizator installation, although originally intended by the Race Course Control Betting Board as protection for themselves, also represents protection for the track operator and, I might emphatically add, for the totalizator company.

We were enthused with our negotiations with Mr. Anderson until we were confronted with the R.I. feature of an acceptable totalizator installation. We then found that speed was not an asset but a detriment. Solid-state electronic equipment is basically built around remarkable memory units and precisely timed sequence access to the memory. At this point, speed has defeated itself for the simple reason that the acceptance of an impulse in the memory must return to the T.I.M. before the memory is available to accept another impulse.

To accomplish the R.I. feature vitally necessary in acceptable totalizator installations, you must then multiply the memory aspect of the installation. Memories of the magnetic ferrite core type to accommodate 12-plane bits, as referred to in the last paragraph of Page 5 of the Digitronics presentation, are the most sensitive and expensive types but not the most substantial. Be it either a ferrite magnetic core type memory or a common seal-up relay buffer type, multiplying memories also multiplies costs. To insure accuracy, electronically-minded men would naturally select the ferrite core type memory. The slightest vibration or bump of any kind could affect the precise timing unit and the memory would then be out of balance -- and the user completely out of business.

The solid-state phase of the Digitronics electronic equipment, incorporating use of the ferrite core type memory coupled with plane bits, is patented and owned exclusively by Sperry-Rand and is used in their Univac computer. It appears that there could be a possible infringement in this phase of the Digitronics equipment.

Joe Lynch and the Digitronics men made a point of mentioning the economical aspects of the use of a fully electronic totalizator. They substantiated their statement by saying that they would use five electronic men in the tote room but later they agreed that the T.I.M. line men would still be required. Therefore, you not only would have the same number of men that would be used with circuitry equipment but you have an additional three men. Our equipment or that of American Totalizator needs only two men and one of them is just to insure that the operation will continue in case the key man should be hit with a truck on his way to work. With the use of our new fully automatic totalizator equipment, we, too, will increase our manpower but only by one. He will be a program man for the operation of the proven Univac solid-state computer. This program man will be trained at Remington Rand's school. The spare man in the tote room, the assistant to the totalizator engineerin charge, could be taught to be the program man's assistant as well.

To acquaint you with my fears concerning the lack of totalizator experience and practical totalizator knowledge of the Digitronics men, after you left the meeting, Joe Lynch, Spencer, the Digitronics men and I inspected your present tote room static equipment. The interconnecting cable on the American Totalizator equipment from the intermediate distribution frame to the portable collector distribution frame incorporated the use of only seven conductor cables. The Digitronics men assumed that the American Totalizator system used only seven wires from every T.I.M. to the aggregating equipment. They therefore have decided that they, too, would use only seven wires from the T.I.M. to the aggregating equipment by means of coding the interconnecting cables. It is just unbelievable that anyone would attempt to build a totalizator by coding conductors from T.I.M. positions to the aggregating equipment. You would save only pennies so far as cable costs are concerned and you would lose the guarantee of positive performance of a single conductor. It is physically, electrically and electronically impossible to use the same conductor for more than one purpose in totalizator construction. It is a very simple matter to code cables and reduce your cable costs. I know -- I have tried, much to my regret. The technique of coding wires greatly diminishes accuracy of the installation.

In all fairness, I must say that Digitronics' new technique of affecting a differential sequence access to the same memory for computational procedure is remarkable, if and when it can be done. However, it is new only if coupled with electronic aggregating equipment. If they are able to perfect this phase electronically, they are going into the wrong business. The opportunities in the computer field are a thousand times greater.

With regard to the proposal advanced by Al Tannenbaum, I cannot conceive of its feasibility nor of the benefits that Roosevelt or Yonkers Raceways would gain if his proposal were accepted.

In the first place, I do not believe Western Totalizator Company can be purchased for $500,000. However, let's consider that unimportant at the moment and let's assume that such an arrangement could be worked out. It appears to me that only I would benefit by such an arrangement, and Roosevelt and Yonkers Raceways would subject themselves to a costly and unnecessary expenditure.

I am assuming that if your associates owned Western Totalizator Company, they would have a means of escape in the event of failure or proven impracticability of the Digitronics fully electronic totalizator. The prototype that is now being built by Digitronics has a maximum capacity of only 16 T.I.M.s. Men like yourself and Mr. Tannenbaum, who have made tremendous, applaudable progress in the harness racing field, can fully appreciate that the functioning of an electronic totalizator, when tied into 400 machines, could very well produce unacceptable results. It is much like a race horse who can run very well carrying 105 pounds but cannot perform as well when carrying 135 pounds. It is unfortunate, therefore, that the possibility of failure cannot be established by testing the prototype that is now being built by Digitronics.

For the moment, let us assume that your earnest desire to be rid of the enslavement of the pre-printed contracts forced on the race track operators, which embody outrageous rates for the use of American Totalizator equipment, has provoked and will prompt you to proceed with the possible use of a fully electronic totalizator which will take at least (regardless of what anyone tells you) two to five years to perfect. It is the same old story repeating itself. When a man is led to believe that he is investing his money in a good thing, he is easily induced to invest more, especially since he has previously invested in this project.

Predicated on the assumption that you and your associates would continue with the development of the fully electronic totalizator, two or more years hence if your fully electronic totalizator proved to be inadequate, you would then use Western Totalizator and all its resources to obtain an Ericson fully automatic totalizator. Even though Western Totalizator has tried in the past to make the impossible inevitable, it could not provide Roosevelt and Yonkers Raceways with a satisfactory, economical, fully automatic totalizator in less than 18 months. Even in that length of time, you would possibly be subjecting yourselves to unnecessary hazards. It is obvious that at least four racing seasons would pass before you would attain your ultimate objective whereas, by the acceptance of my proposal, you would be in a position to accomplish

BEST COPY AVAILABLE

precisely the same objective without the unnecessary and costly investment of $500,000 and an undesirable arrangement with me when acquiring Western Totalizator.

The proposal I suggested, wherein I asked you to consider a loan of $325,000 to Western Totalizator, collateralized by hypothecating my 219,000 shares of Western stock, would provide the means for Western to proceed immediately to install its first fully automatic totalizator at Blue Bonnets Raceway in Montral. This would be accomplished in twelve to eighteen months. You notice that I mention as little as twelve months for the installation of fully automatic totalizator equipment in Montreal. The time factor diminishes because in Montreal we already have 60% of the appurtenant equipment that would be incorporated in our first installation.

To point out the necessity for the extreme precautionary measures that must be taken when you are catering to the thousands of people who frequent race tracks nightly, if and when Western Totalizator has the financial resources, they will install at Blue Bonnets a completely new, fully automatic totalizator while the existing one is satisfactorily catering to the public. In other words, at Blue Bonnets we intend to have two totalizator rooms, the present one on the ground floor and a new one to be located on the mezzanine. The public indicator now installed at Blue Bonnets has become too small because of the construction program that took place years after we installed the present tote board. We therefore will build another board of adequate size directly behind the existing one. This plan has been discussed with Blue Bonnets owners and officials and they have agreed to provide the additional room in view of the fact that we will provide them with a more economical totalizator installation.

Let us assume for the moment that your group is desirous of advancing to Western Totalizator the $325,000 previously mentioned. Let us further assume that you would proceed with the Digitronics fully electronic totalizator. If your associates participated in the laon, Western would then be in a position to provide you with fully automatic equipment in six to eight months if your Digitronics equipment failed to operate satisfactorily.

Considering that Western Totalizator is able to assure Roosevelt and Yonkers Raceways the purchase of an amount of stock equivalent to the amount of issued stock as of the date when such purchase is consummated, from an investment and an insurance point of view, I am inclined to believe that my suggestion is more attractive.

I would like to suggest further that if my idea is accepted, the loan should be without interest only if you decide to participate in Western Totalizator on a 50% basis at some later date. I believe you are entitled to the choice that if you do not participate, then the loan should be paid back at the rate of $100,000 a year, beginning in 1963, and bearing at least 4% interest.

Please forgive me for burdening you with this long letter. However, I do feel a personal obligation to make you aware of a few of the risks involved in the Digitronics equipment.

Sincerely,

Joseph G. Lease

JGL:ms

A432

ROOSEVELT RACEWAY

SIMULATOR

9175 PR

EXHIBIT A

[redacted]

DIGITRONICS CORPORATION
Albertson Avenue
Albertson, L.I., N.Y.
November 1959

TABLE OF ILLUSTRATIONS

Figure Number	
1	CENTRAL CONTROL UNIT AND DISPLAY PANEL
2	DISPLAY OF DAILY DOUBLE POOL
3	DOLLARS BET ON COMBINATION OF 1ST RACE WINNER AND EACH HORSE IN 2ND RACE
4	TOTAL TRANSACTIONS FOR COMBINATION OF 1ST RACE WINNER + EACH HORSE IN SECOND RACE
5	TOTAL TRANSACTIONS FOR COMBINATION OF ANY SELECTED HORSE IN 2ND RACE + EACH HORSE IN 1ST RACE
6	PROBABLE ODDS AND TOTALS BET ON EACH HORSE DURING REGULAR BETTING
7	WIN, PLACE AND SHOW POOLS
8	TOTAL WIN, PLACE, SHOW POOLS AND INDIVIDUAL HORSE DATA AFTER THE END OF BETTING
9	COMPLETE CONTROL PANEL

SECTION 1 GENERAL DESCRIPTION

The purpose of the Simulator is to demonstrate, on a smaller scale, how the actual system of ticket dispensing, computation and display will function for both the Daily Double and regular betting operations. The basic differences between the Simulator and the ultimate and complete system are:

1.1 Less betting units are used:

The Daily Double operation uses 8 machines for recording. Sixteen sources of betting information are provided for regular betting.

1.2 Indicators display data in timed sequences:

a) Instead of displaying information internally for use of computation personnel and externally for the betting public, the Simulator demonstration provides information for internal use. Any information so displayed could be made available to show on all public display panels.

b) Instead of displaying information simultaneously and necessitating the use of many display panels, the Simulator system displays information sequentially and identifies the data shown. For example in the Daily Double the gross dollar total bet for each horse in the second race, in combination with the winning horse, is shown sequentially. The same procedure is used to display the probable win odds for each horse in the regular betting operation.

c) The capability of manual control of display of information can be readily demonstrated by the Simulator. By pressing the "One Step" button in the display section of the Control Panel (Figure 3) the information being displayed at the time remains fixed. The next information is not displayed until the "Step" button is pressed. Thus in the "One Step" mode the display of odds for each horse is under complete control of the "step" button.

1.3 Daily Double and regular betting operation are not simultaneous:

The Simulator operates either for the Daily Double or the regular betting operation as determined by the setting of the operation selector button on the Control Panel.

1.4 Limited betting denominations:

To conserve equipment only $2 and $10 bet denominations are handled.

SECTION 2 DAILY DOUBLE OPERATION

2.1 During the betting period:

Bets on two 8-horse races are recorded by eight dual keyboard simulated (non-ticket dispensing) machines. The value of the transaction for each machine is either $2.00 or $10.00 as determined by the setting of the plugboard in the Central Control Unit (see Figure 1).

BEST COPY AVAILABLE

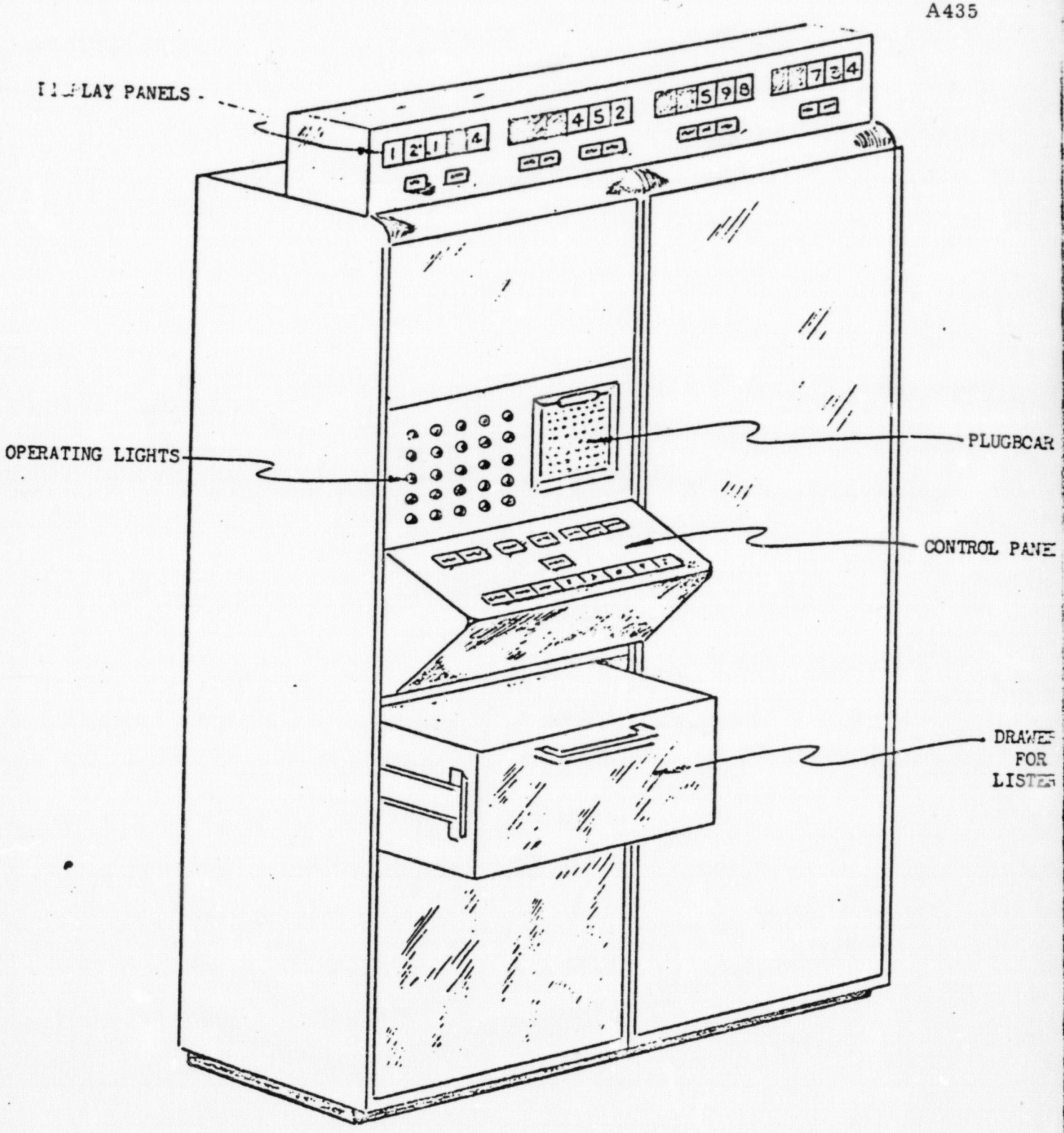


FIGURE 1 CENTRAL CONTROL UNIT AND DISPLAY PANELS

2.2 At the end of the betting period:

On receipt of an "End Betting" signal from the Central Control Unit all simulated machines become inoperative. The Daily Double total pool is displayed (Figure 2).

2.3 At the end of the first race:

The "Dollar Total" and the "First Race" buttons are pressed. Then one of eight buttons corresponding to the winning horse is pressed. This results in a display and print-out of the dollars bet for each horse in the second race in combination with the first race winner in the following manner (also see Figure 3).

2.3.1 The display for each horse in the second race in combination with the first race winner appears in sequence. As the number indicating the horse in the second race lights in the "Horse No." panel, the dollars bet on the combination appear on the appropriate panel, and the term "Daily Double" and "$ Bet" is illuminated (Figure 3).

2.3.2 While the information is displayed the same data is printed on the lister using a line per horse combination. The display for each horse lasts for three seconds.

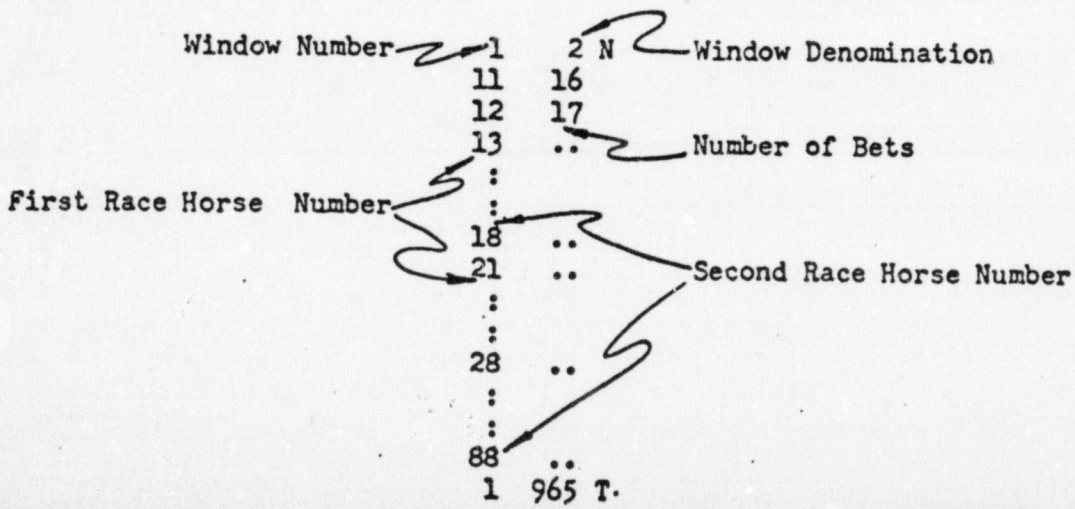
2.4 On demand any of the following data is available by selection:

2.4.1 Total $2 or $10 transactions for each horse in the second race in combination with the first race winner (Figure 4).

2.4.2 Total $2 or $10 transactions of any horse in the first race in combination with each horse in the second race (Figure 4).

2.4.3 Total $2 or $10 transactions of any horse in the second race in combination with each horse in the first race (Figure 5)

2.5 By pressing the "Window Print-Out" button (Figure 9) a print-out occurs on the lister of the total transactions for that window in the following format:



```
2    2 N
11  36
 :
 :
18  75
 :
 :
88  56
 3 524 T
```

The entire print-out takes approximately 3 minutes.

SECTION 3 REGULAR BETTING OPERATION

3.1 During the betting period:

3.1.1 Bets are recorded on fourteen simulated and two actual ticket dispensing machines. Each machine has ten keys to provide for a 10-horse race. The plugboard of the Central Control Unit (Figure 1) can be arranged to assign any of the following values to each of the 16 machines:

$ 2.00 W or P or S
$10.00 W or P or S
$ 6.00 ($2 WPS)
$10.00 ($5 WP)

3.1.2 Two sets of figures are displayed automatically during this period. First, and in sequence for each horse, the following is displayed (also see Figure 6):

Horse No.	Probable Odds	Total Win Bet	Total Place Bet	Total Show Bet

(for the horse indicated)

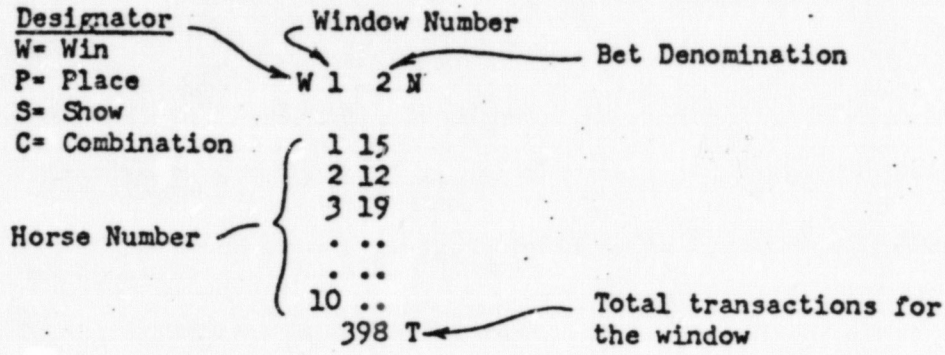
The term "Win", "Place", and "Show" light up beneath each panel. The info mation for each horse appears for three seconds.

3.1.3 Following the display for each horse a total pool display occurs. The "Odds" and "Horse No." panels are dark and the gross total Win, Place and Show Pools are displayed. Beneath each panel the designation "Win", "Place", "Show" and "Pool" light up. This display appears for 10 to 30 seconds, depending on the desired overall cycle time (see Figure 7).

3.2 At the end of the regular betting period, determined by pressing the "End Bet" button on the Central Control Unit the following occurs:

3.2.1 The display cycles are discontinued except as called for by the special controls (see Section 4). The Win, Place and Show Pools and the totals bet on each horse for Win, Place and Show as of the end of betting are obtained as shown in Figure 8.

3.2.2 Pressing the "Window Print-Out" button (Figure 9) results in a print-out in the following format:



The sequence of the print-out is:

all $ 2.00 win windows
all $10.00 " "
all $ 2.00 place windows
all $10.00 " "
all $ 2.00 show windows
all $10.00 " "
all $ 6.00 combination windows
all $10.00 " "

Following the print-out of the information for the $10.00 combination window, the total dollar win, place and show pools are printed thus:

$ 19645 T
$ 29768 T
$ 35792 T

SECTION 4 SPECIAL CONTROLS (Figure 9)

4.1 There are a wide variety of unusual circumstances which may arise for the operation of the parimutuel system during a race. These include dead heats, scratches, consolation pools, etc. In the Simulator no attempt is made to handle these situations automatically. Instead, the operator is given controls which allow him to print-out and display the necessary data for handling such situations. During the betting periods, either regular or Daily Double, these special controls will be disabled in the Simulator. In the final machine this restriction will be modified.

4.2 During the regular betting operation the controls will operate as shown below. It should be noted that, because the special controls are inoperative during the actual betting period, it will be impossible to correct the probable odds display in the event of a late scratch. This will not be the case in the final machine.

4.2.1 Three pushbuttons in the category "Pool Select" marked "Win", "Place" and "Show" are used to select the pool from which print-out and display are to be derived.

4.2.2 A group of four switches are provided for the "Display Mode" function.

4.2.2.1 When the "Dollar Total" pushbutton is set, the ensuing print-out and display will represent the total amount of money bet, in the pool selected in 4.2.1 above, on the horse selected in 4.2.3 below.

4.2.2.2 When the "Transaction Total" button is set, the ensuing print-out and display will represent the total number of transactions in the pool selected above and on the horse selected in section 4.2.3 below. (Each $2 bet represents one transaction and each $10 bet represents five transactions.)

4.2.2.3 When the "$2 Transaction" button is set, the ensuing print-out and display will represent the total number of $2 bets in the pool selected above and on the horse selected in section 4.2.3 below. (Each bet counting as one transaction.)

4.2.2.4 When the "$10 Transaction" button is set the ensuing print-out and display will represent the total number of $10 bets in the pool selected above and on the horse selected in section 4.2.3 below. (Each bet counting as five transactions.)

4.2.3 Ten pushbuttons are provided to enable the particular horse for which data is desired, to be selected. After the selections made in the previous section, immediately above, have been made, operation of the "Horse Number" pushbutton initiates the print-out and display.

4.2.4 As an example, let it be assumed that a horse has been scratched during the betting and it is necessary to correct the pools. After the end of betting, the "Win" button is selected, the "Dollar Total" pushbutton is pressed and the "Horse Number" button is pressed. The printer and display unit will show the amount of money bet on that horse to win. The "$2 Transaction" button is then pressed and the "Horse Number" is pressed. The printer and display unit will show the number of $2 win bets on the horse. (Each bet counting as five transactions.) Similarly the $10 bets and the corresponding Win, Place and Show data can be displayed.

4.3 <u>During the Daily Double operation</u>.

The operation of the special controls are exactly analagous to the operations described under section 4.2 above. The only exception is that the "Pool Select" controls are disabled and the "1st Race" and "2nd Race" pushbuttons become operative. These latter buttons define the race to which the "Horse Number" buttons apply. Thus, to obtain the data from which the Daily Double payoff computation is to be manually made, the operator sets the "1st Race" pushbutton, the "Dollar Total" pushbutton, and the appropriate "Horse Number" pushbutton. The resulting print-out and display will show the amount of money bet on the selected horse in the first race with each of the horses in the second race and followed by the total as shown below:

$ 1028 (combination of selected horse in first race with horse 1 in second)
$ 924 (" " " " " " " " " 2 " ")
$ 1160 (" " " " " " " " " 3 " ")
$ 204 (" " " " " " " " " 4 " ")
$ 128 (" " " " " " " " " 5 " ")
$ 1006 (" " " " " " " " " 6 " ")
$ 644 (" " " " " " " " " 7 " ")
$ 758 (" " " " " " " " " 8 " ")

$ 5842 (the total amount of money bet on the selected horse in the 1st race)

4.4 In the event a horse is scratched a wire will be plugged into the plugboard on the Central Control Unit so that no further betting can occur on that horse on any betting machine. If a Seller attempts to issue a ticket for that horse, the ticket issuing machine will not emit the ticket. The key of the issuing machine will remain locked in the "down" position and the transaction will not be recorded. The Seller will be able to release the locked key by operating a special release button. However, even when the key is released the ticket will not issue and the bet will not record at the Central Unit.

SECTION 5 EQUIPMENT

The Simulator will consist of the following equipment (see figures):

2 Ticket dispensing machines. Each machine will have ten keys for issuing tickets for ten horses, plus a key to allow the issuing of a test ticket, plus a release key. The latter is used to release the machine if a disallowed horse number key is used. If such a key is used no ticket issues and no transaction is recorded centrally. The machine includes a mechanical counter which records the total number of tickets issued.

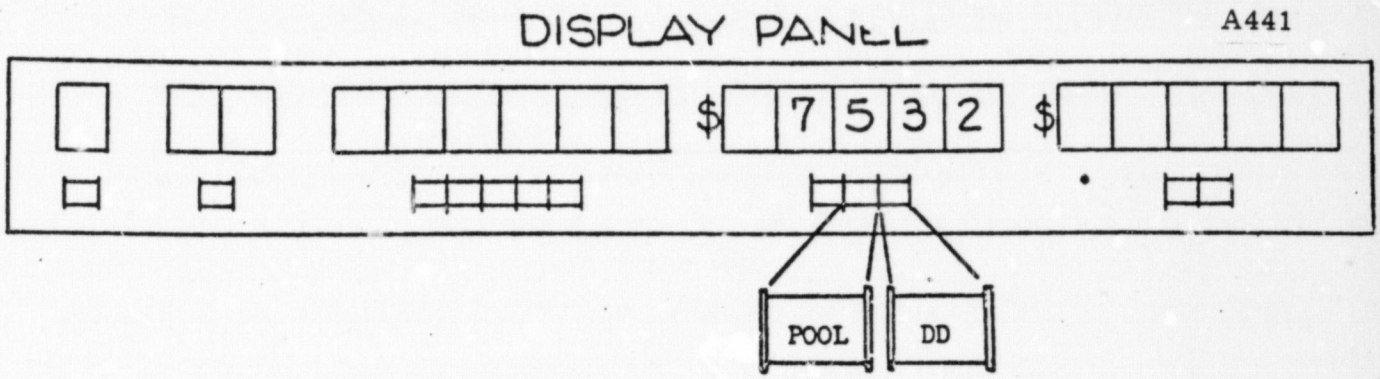
The printed ticket will be similar in format and paper to the tickets presently dispensed at the track.

16 Simulated (non-ticket dispensing) machines. Each machine has ten keys capable of recording betting information for ten horses. During the Daily Double operation the 16 machines are paired to provide 8 dual keyboard machines.

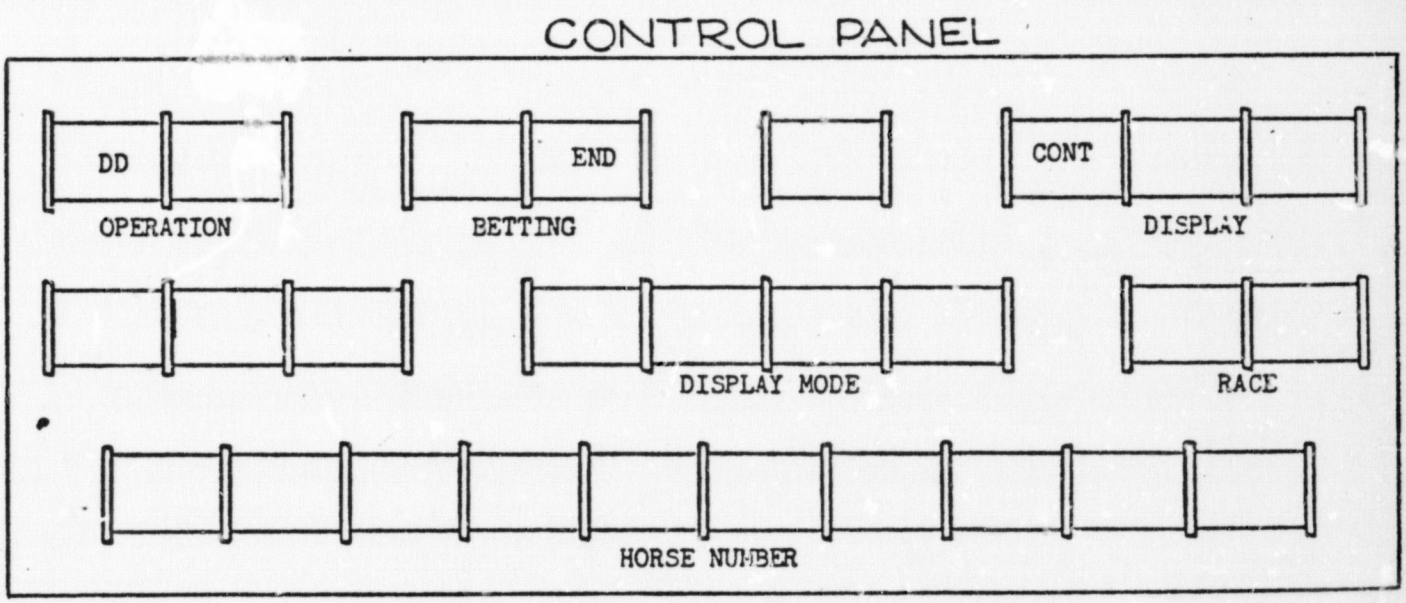
1 Printer (adding-machine type)

4 Five-digit in-line displays which show illuminated numerals.

3 Racks of electronic accumulator, computation, checking and control equipment capable of accumulating up to 99 transactions for each horse for each window; computing the information described in the proposal and controlling the print or display of all information required. A plugboard is provided which can be arranged to determine the value and nature of the transaction for each machine.



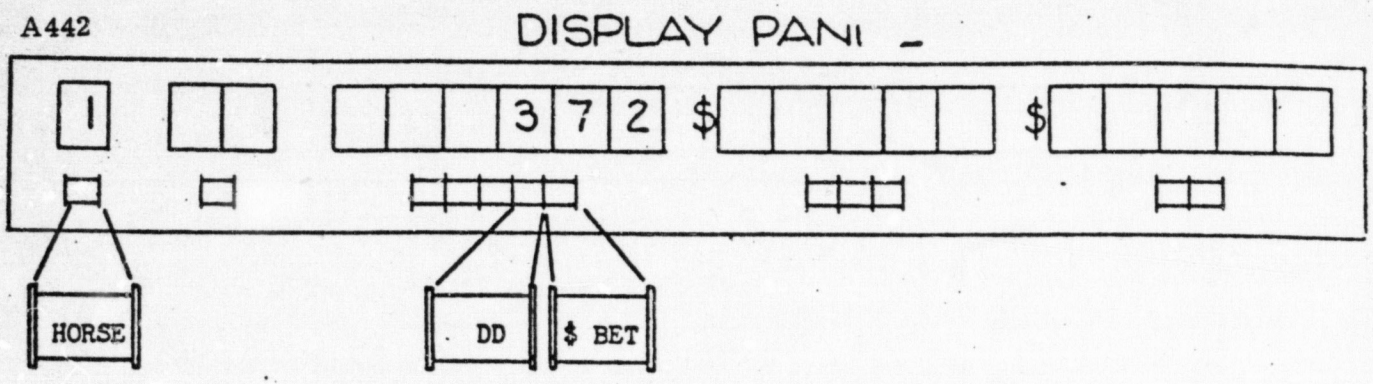
Indicates that the total Daily Double pool is $7532.
(See Sec. 2.2)



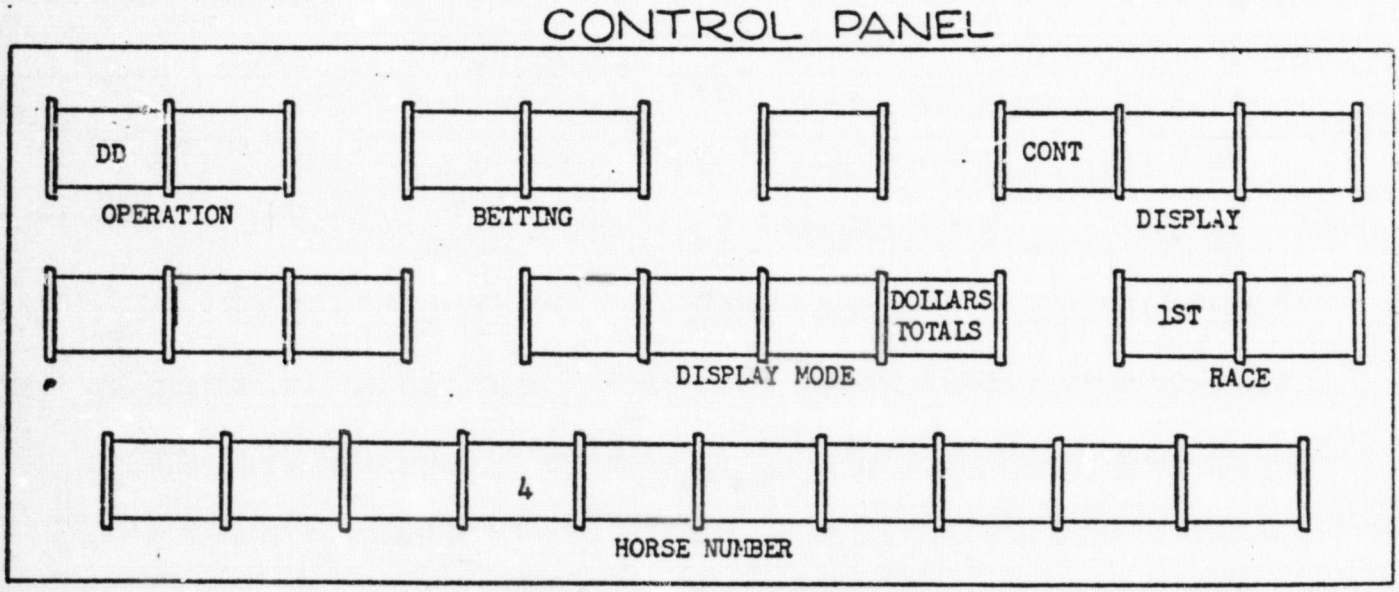
Pressing the "End Betting" button during the Daily Double operation automatically displays the Daily Double pool.

FIGURE 2 DISPLAY OF DAILY DOUBLE POOL

A442

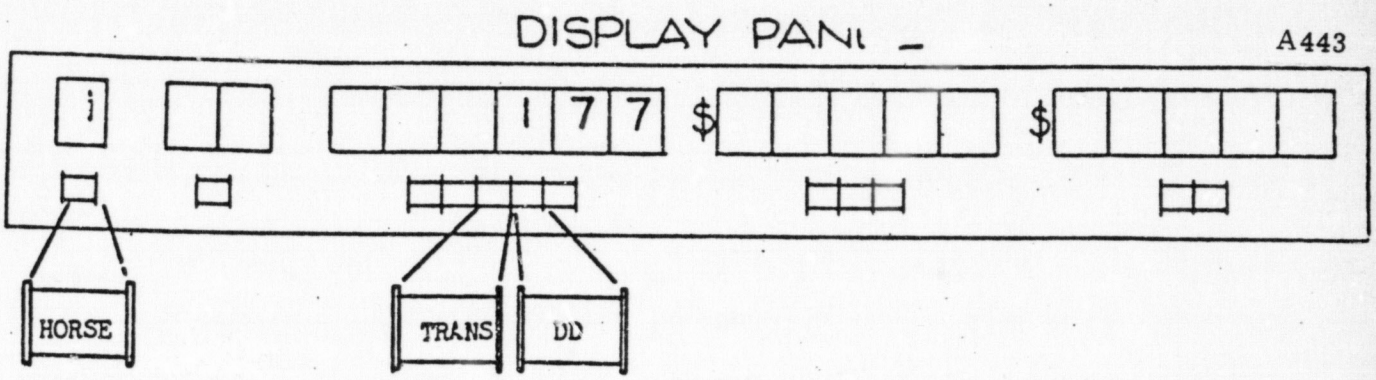


Shows that the dollars bet on the combination of the 1st race winner horse #4 (see the Control Panel) and horse #1 in the second race is $372. In 3 secs. number 2 appears above "Horse" with a dollars bet amount. This continues automatically through 8 combinations.

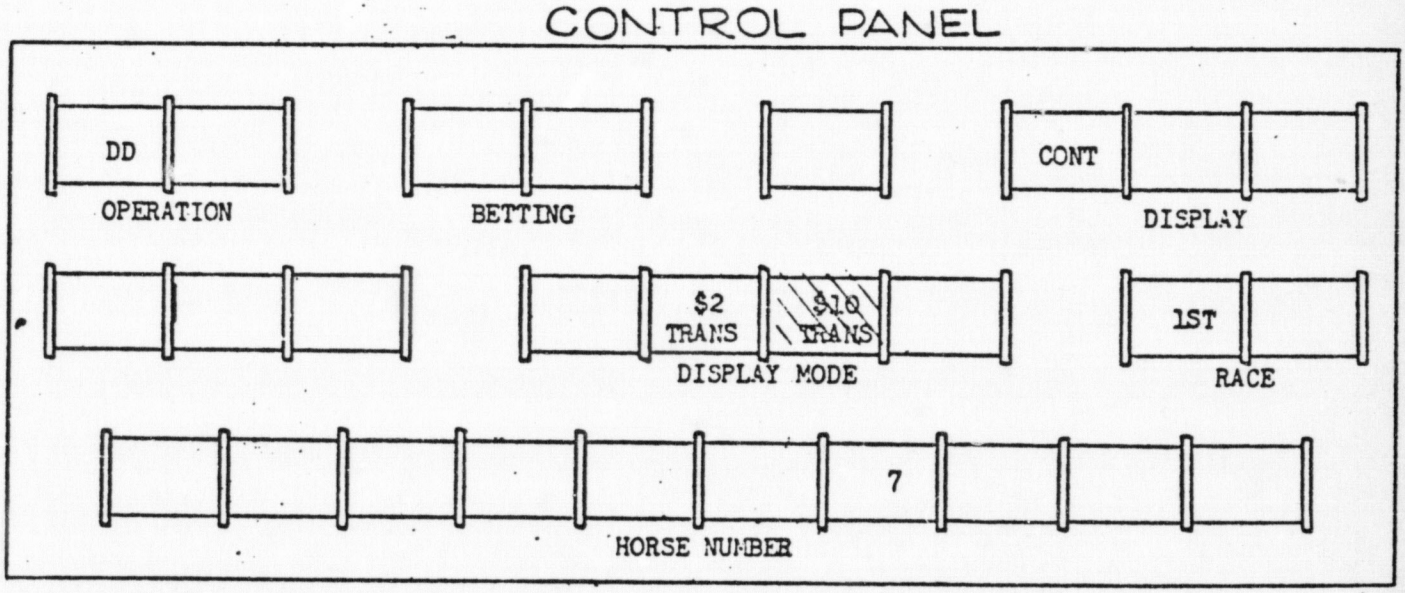


At the end of the first race (see Sec. 2.3) to obtain a display and print-out of the dollars bet on the combination of the first race winner with each horse in the second race press: (1) "Dollars Total"; (2) "1st Race"; (3) First race winner (assume #4 in above example).

FIGURE 3 DOLLARS BET ON COMBINATION OF 1ST RACE WINNER AND EACH HORSE IN 2ND RACE



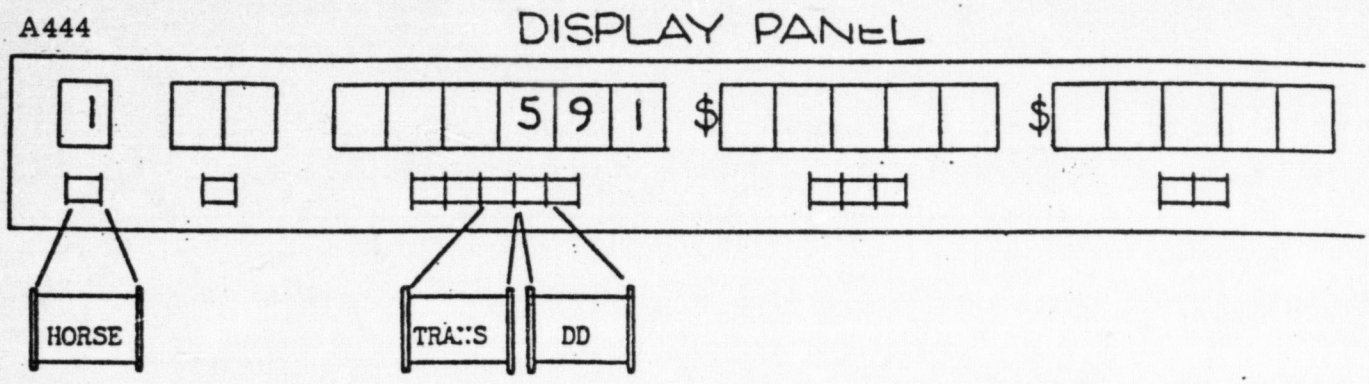
Shows the total $2 TRANSACTIONS for the combination of the 1st race winner horse #7, and horse #1 in the 2nd race. In 3 seconds #2 appears automatically and the total for the new combination appears. Every 3 seconds the horse number and $2 transactions total changes until all 8 combinations have been displayed.



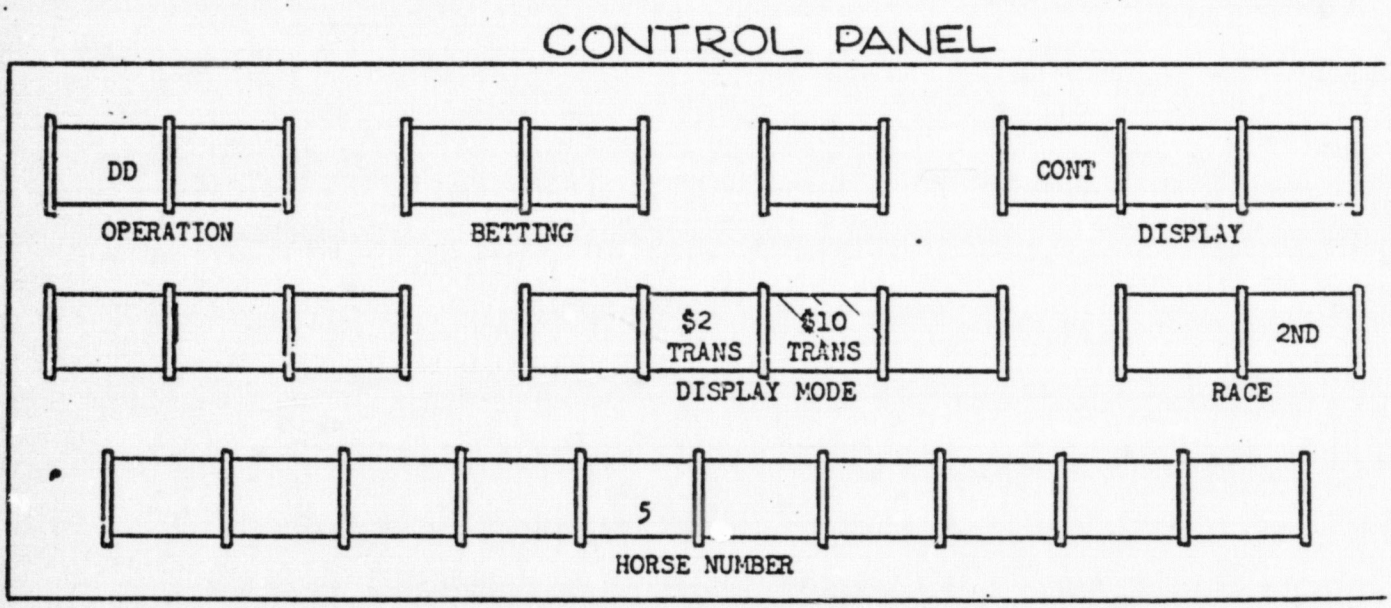
AT THE END OF THE FIRST RACE to obtain display of total $2 TRANSACTIONS for the combinations of the first race winner with each horse in the second race press: (1) "$2 TRANS" ("$10 TRANS" to get the total $10 transactions); (2) "1ST RACE"; (3) First Race Winner (in above example assume #7).

FIGURE 4 TOTAL TRANSACTIONS FOR COMBINATION OF 1ST RACE WINNER + EACH HORSE IN SECOND RACE

A444



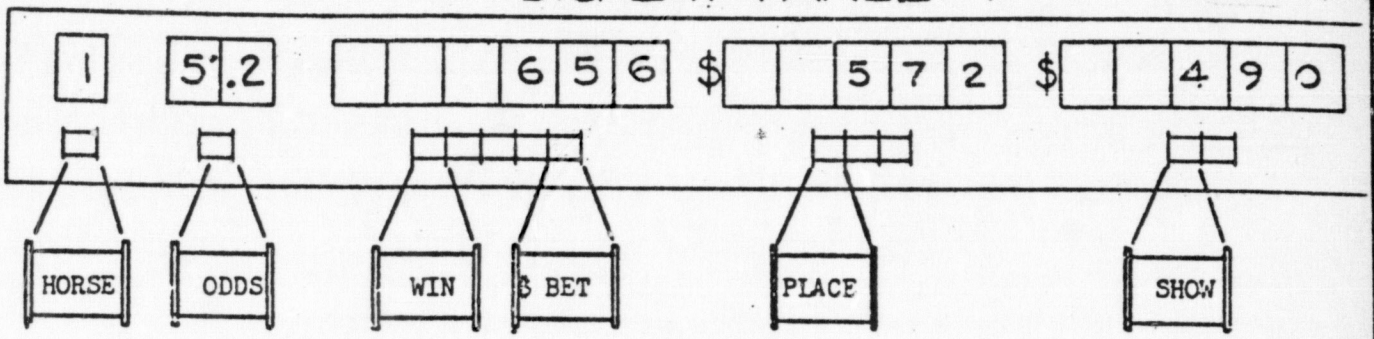
Indicates that 591 $2 transactions have been recorded for horse #5 in the second race in combination with horse #1 in the first race. In 3 seconds a #2 appears and the total will indicate the $2 transactions for horse #5 in combination with horse #2 of the first race.



AT THE END OF THE FIRST RACE: For display and print-out of total $2 (or $10) transactions for a selected horse in the 2nd race in combination with each first race horse, the procedure is the same as described in Figure 4 except that "2ND RACE" button is pressed. Press: (1) $2 TRANS (or $10 TRANS); (2) "2ND RACE"; (3) The number of the selected horse in the second race (assume #5).

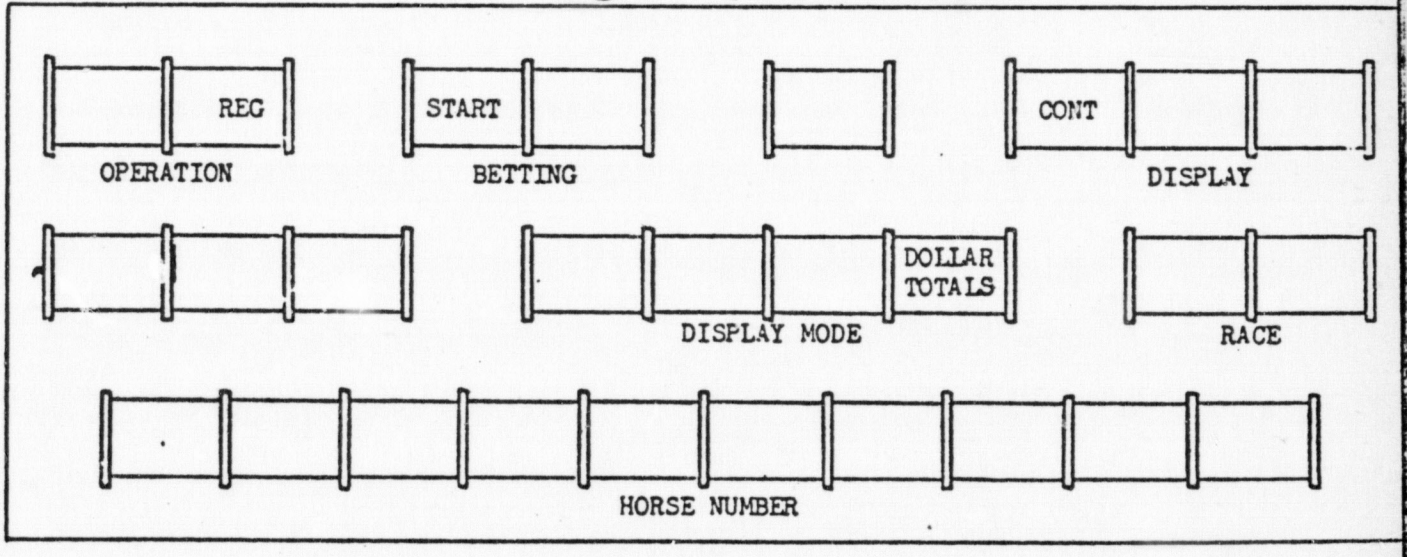
FIGURE 5 TOTAL TRANSACTIONS FOR COMBINATION OF ANY SELECTED HORSE IN 2ND RACE + EACH HORSE IN 1ST RACE

DISPLAY PANEL



Indicates that horse #1 has probable odds of 5 to 2, a total bet of $656 for win; $572 for place and $490 for show. In 3 seconds a "2" appears with the amounts for the second horse. The display continues automatically in sequence for each horse.

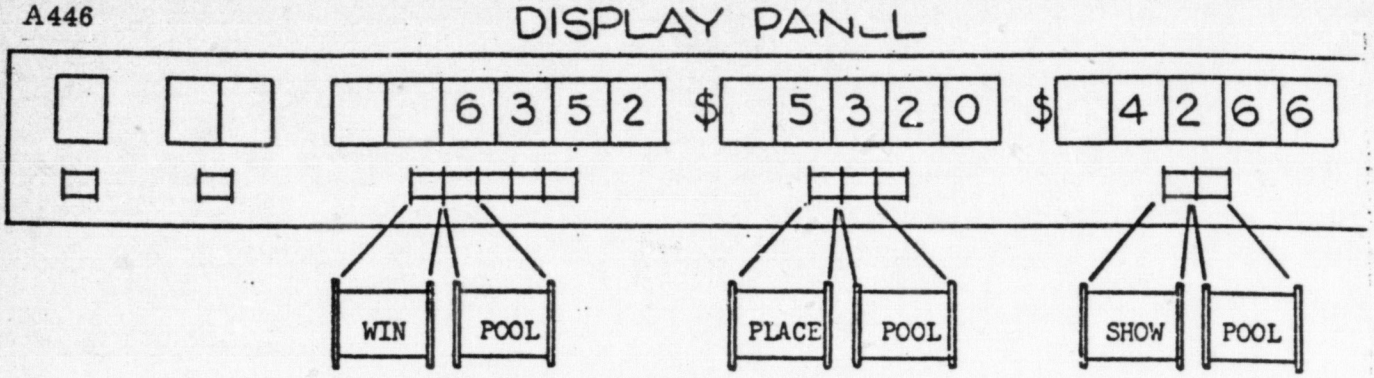
CONTROL PANEL



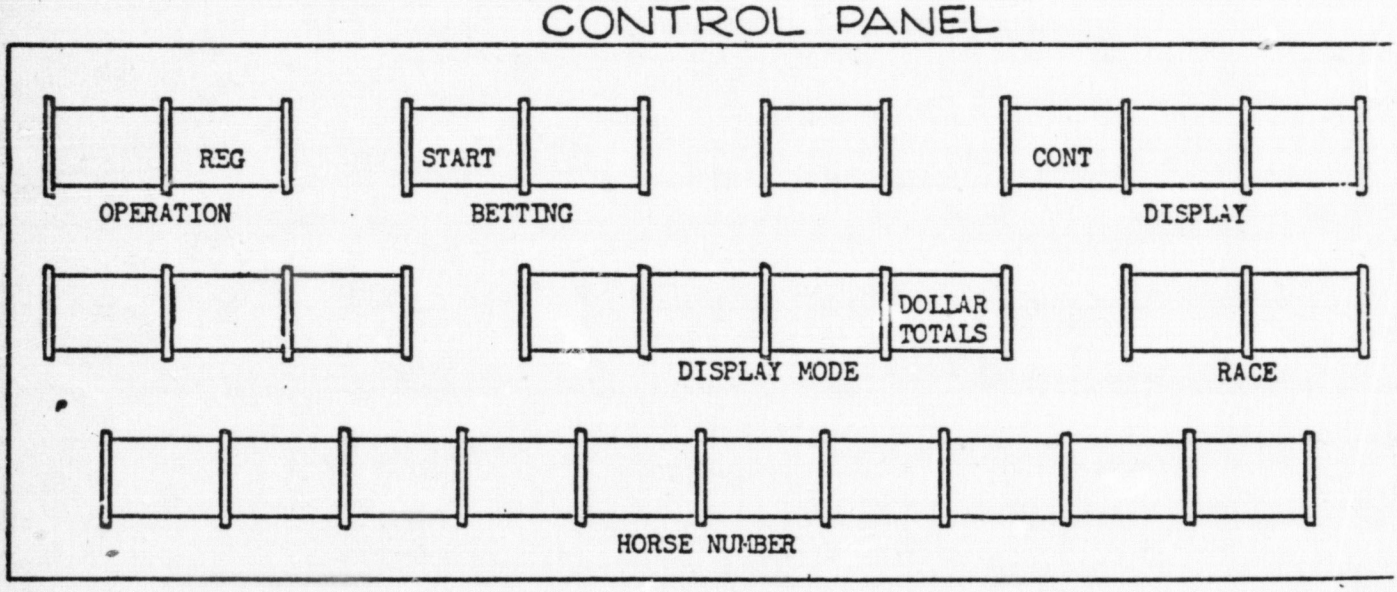
At the start of betting the Control Panel has the above appearance as a result of pressing the four buttons indicated.

FIGURE 6 PROBABLE ODDS AND TOTALS BET ON EACH HORSE DURING REGULAR BETTING

A446

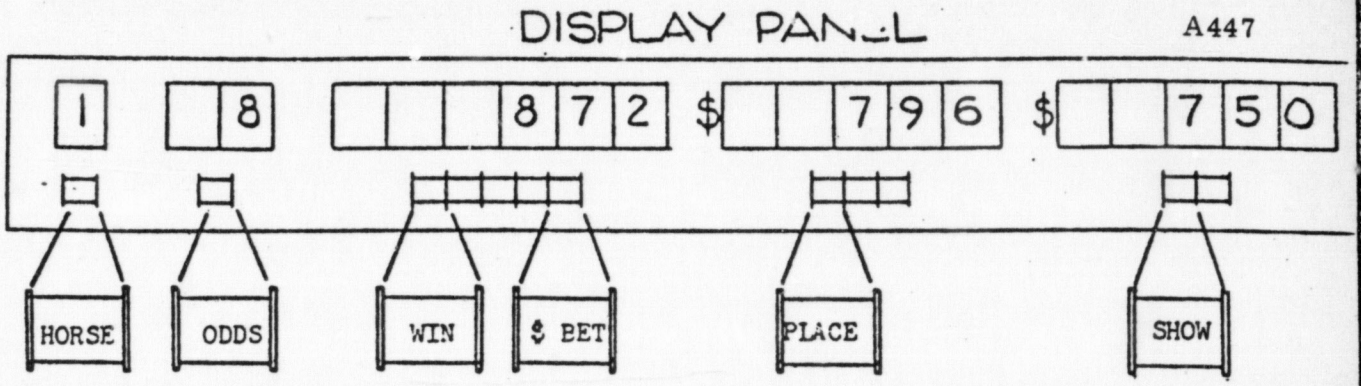


DURING BETTING THERE IS NO CHANGE IN THE Control Panel from Figure 6. Total "Win", "Place" and "Show" pools are displayed automatically following the display of the individual horse "Dollars Bet" totals.



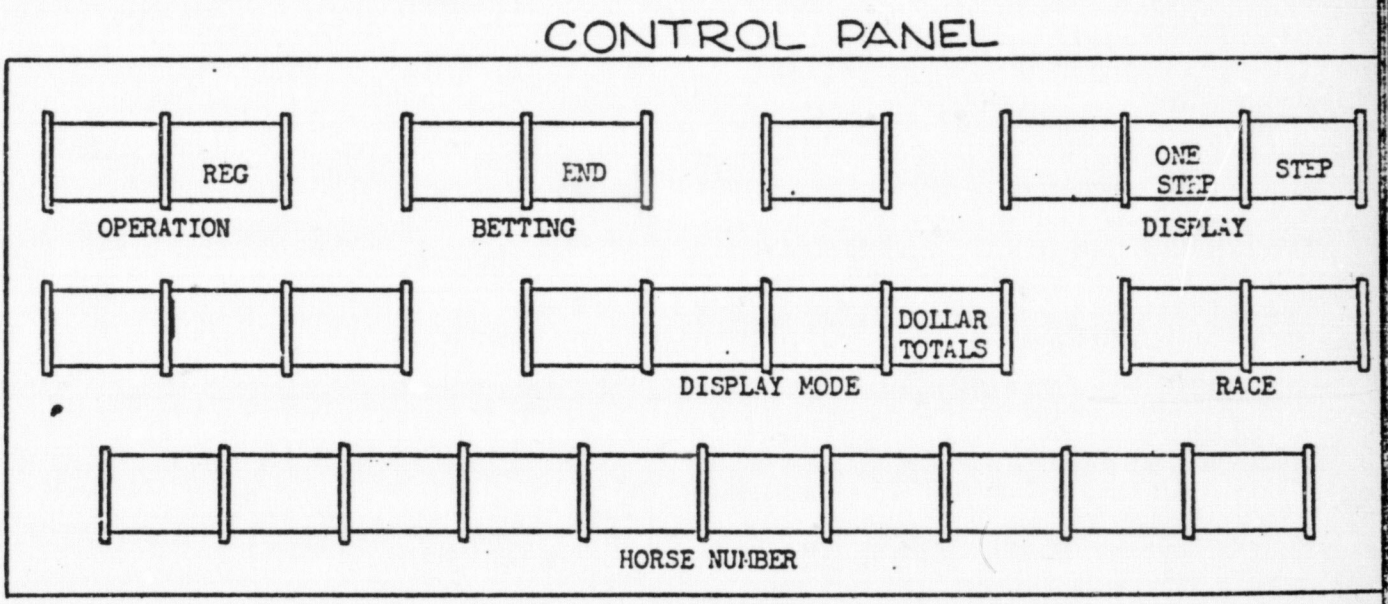
Indicates the total WIN, PLACE and SHOW POOLS in dollars.

FIGURE 7 WIN, PLACE AND SHOW POOLS



AT THE END OF BETTING (1) Pressing the "End Betting" button discontinues the displays shown in Figures 6 and 7. The same information displayed in Figures 6 and 7 but as of the End of the Betting period can now be obtained under manual control as follows:

Press: (1) "One Step"
(2) "Step"



Indicates in sequence, each time the "Step" button is pressed, the information shown for each horse (as in Figure 6) followed by the total WIN, PLACE and SHOW pools (as in Figure 7).

FIGURE 8 TOTAL WIN, PLACE, SHOW POOLS AND INDIVIDUAL HORSE DATA AFTER THE END OF BETTING

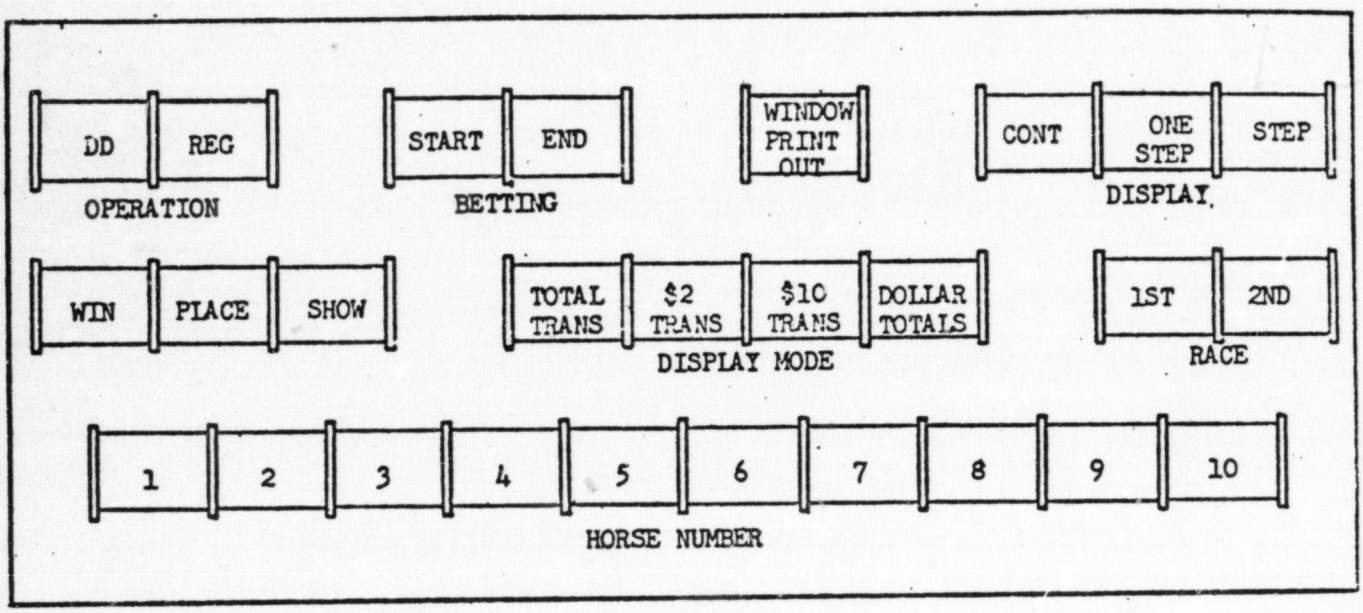


FIGURE 9 COMPLETE CONTROL PANEL

P- Ex #1 for ID

11/18/74

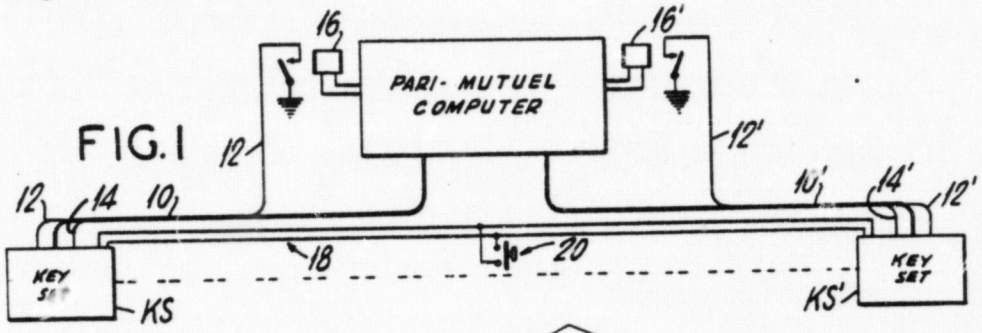
A449

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 1

FIG. 1



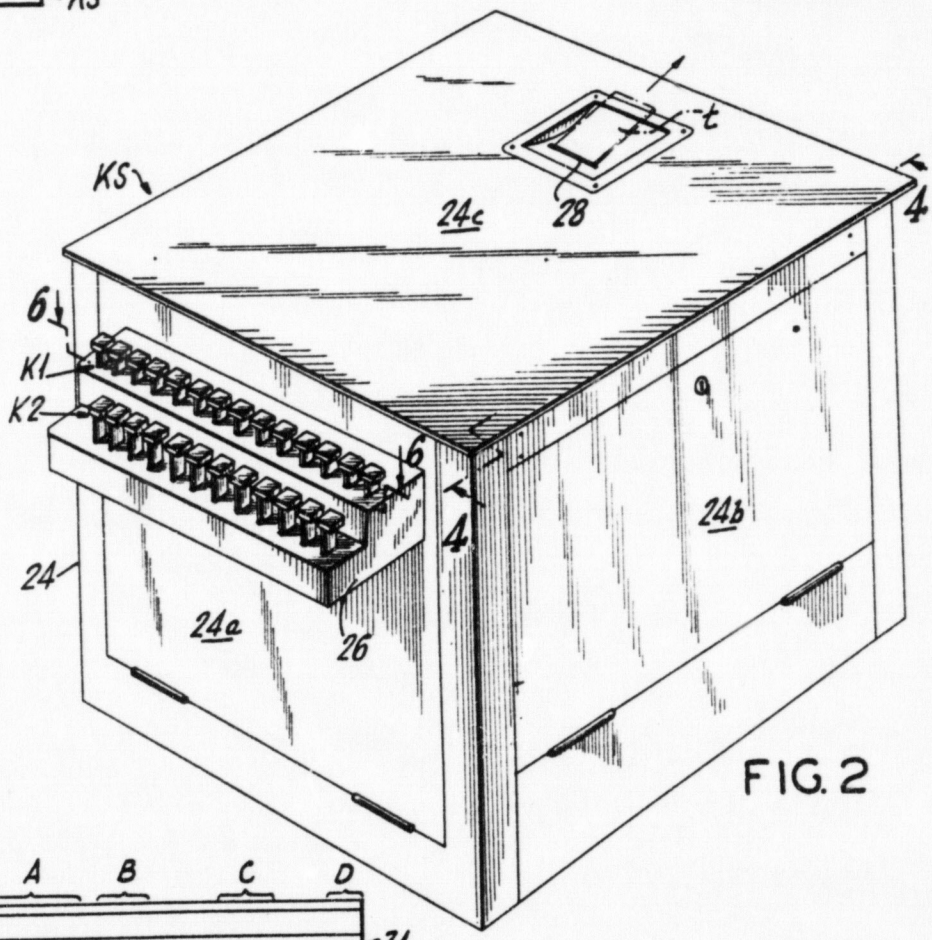


FIG. 2

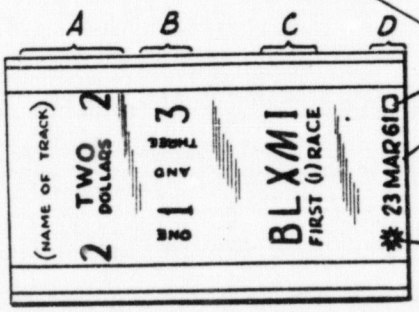


FIG. 3

INVENTOR.
ALBERT F. HOHMANN

BY S.C. Yuter

ATTORNEY.

A450

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 2

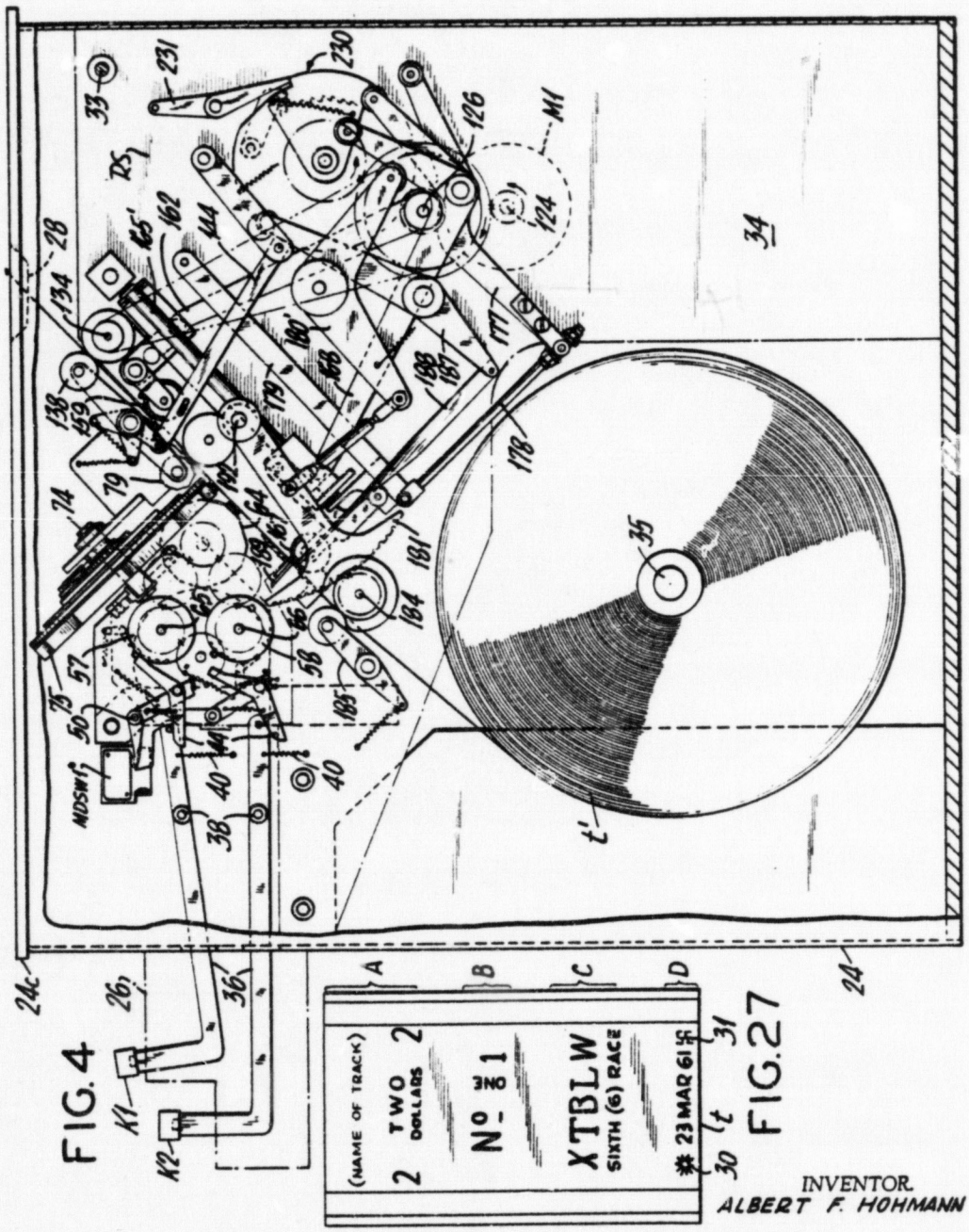


FIG. 4

FIG. 27

INVENTOR.
ALBERT F. HOHMANN

BY S. A. Yuter

ATTORNEY.

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 3

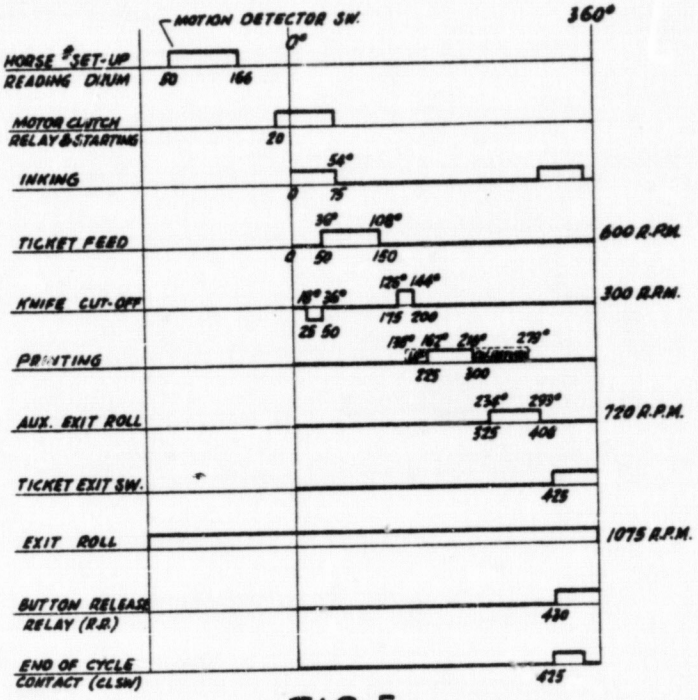


FIG. 5

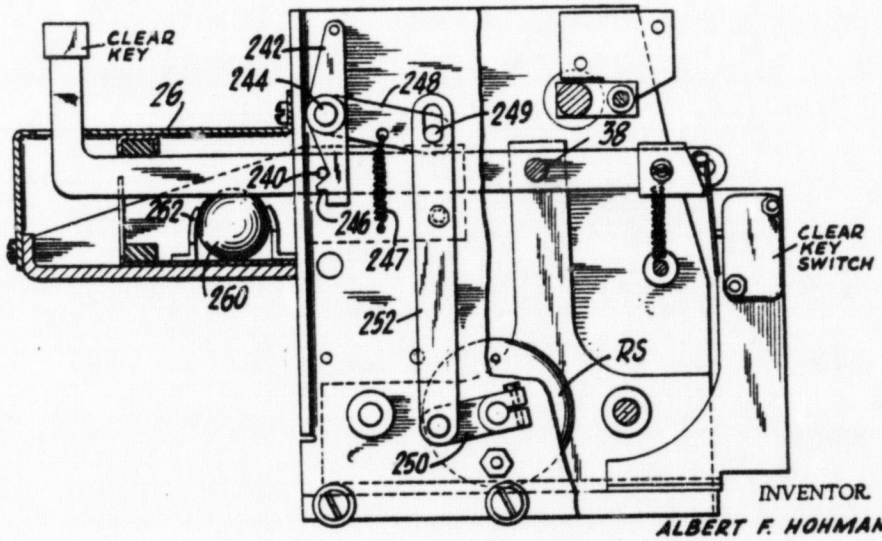


FIG. 7

INVENTOR.
ALBERT F. HOHMANN
BY S. C. Yuter
ATTORNEY.

A452

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 4

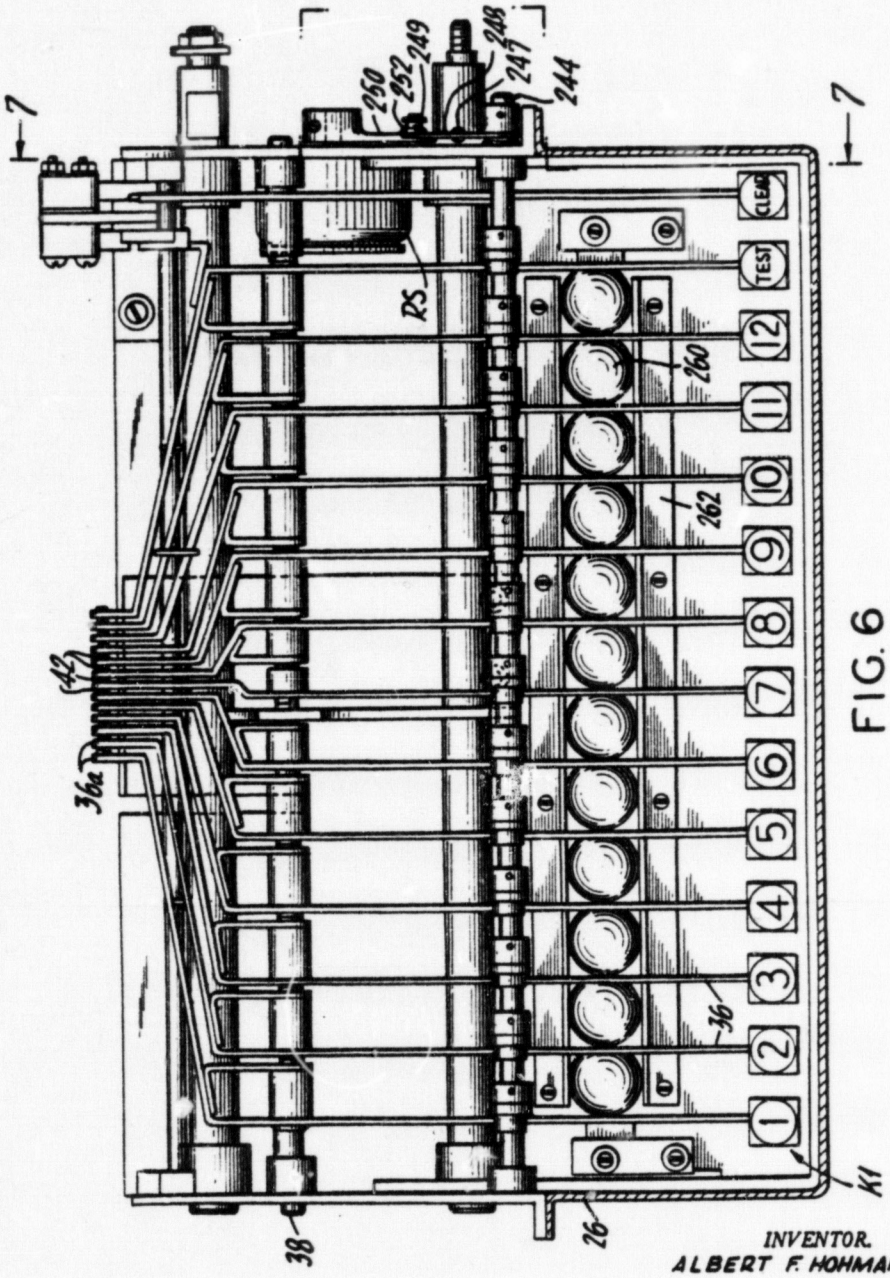


FIG. 6

INVENTOR.
ALBERT F. HOHMANN
BY S. E. Yuster
ATTORNEY.

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 5

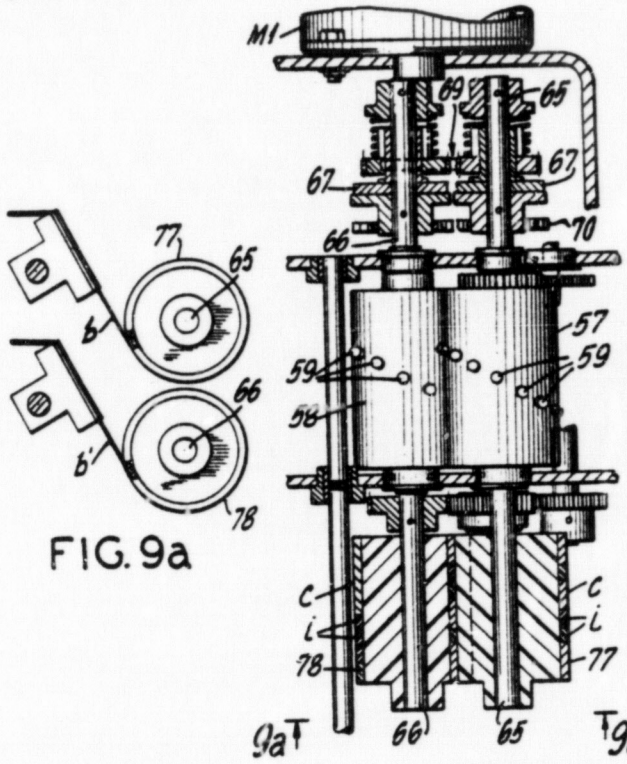


FIG. 9a

FIG. 9

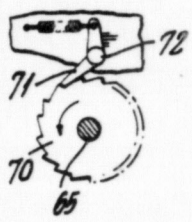


FIG. 9b

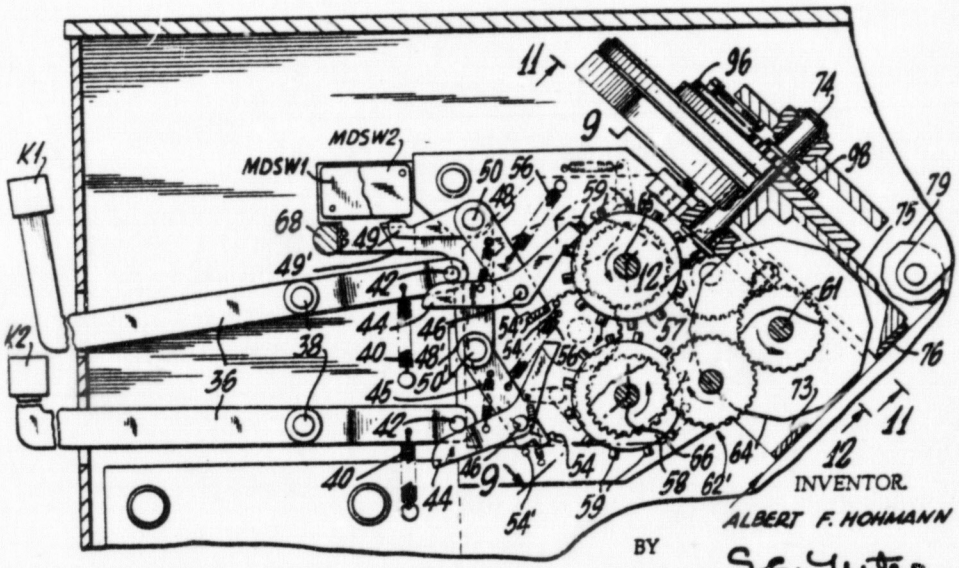


FIG. 8

A454

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 6

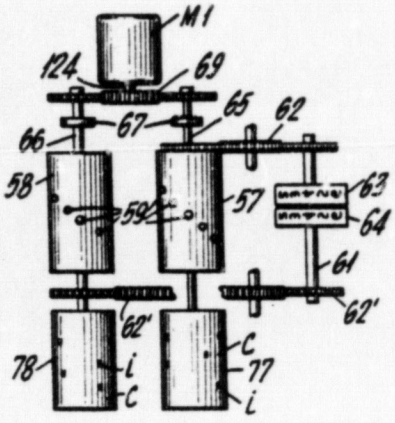


FIG. 10

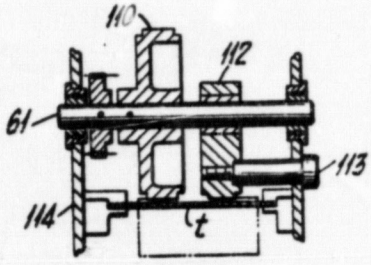


FIG. 12a

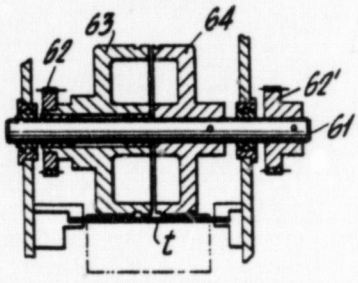


FIG. 12

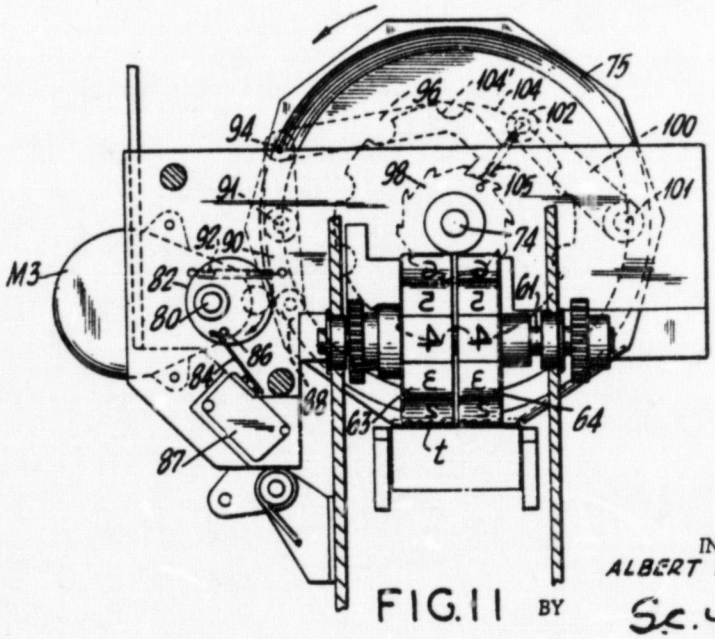


FIG. 11

INVENTOR.
ALBERT F. HOHMANN
BY S. C. Yeiter
ATTORNEY.

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 7

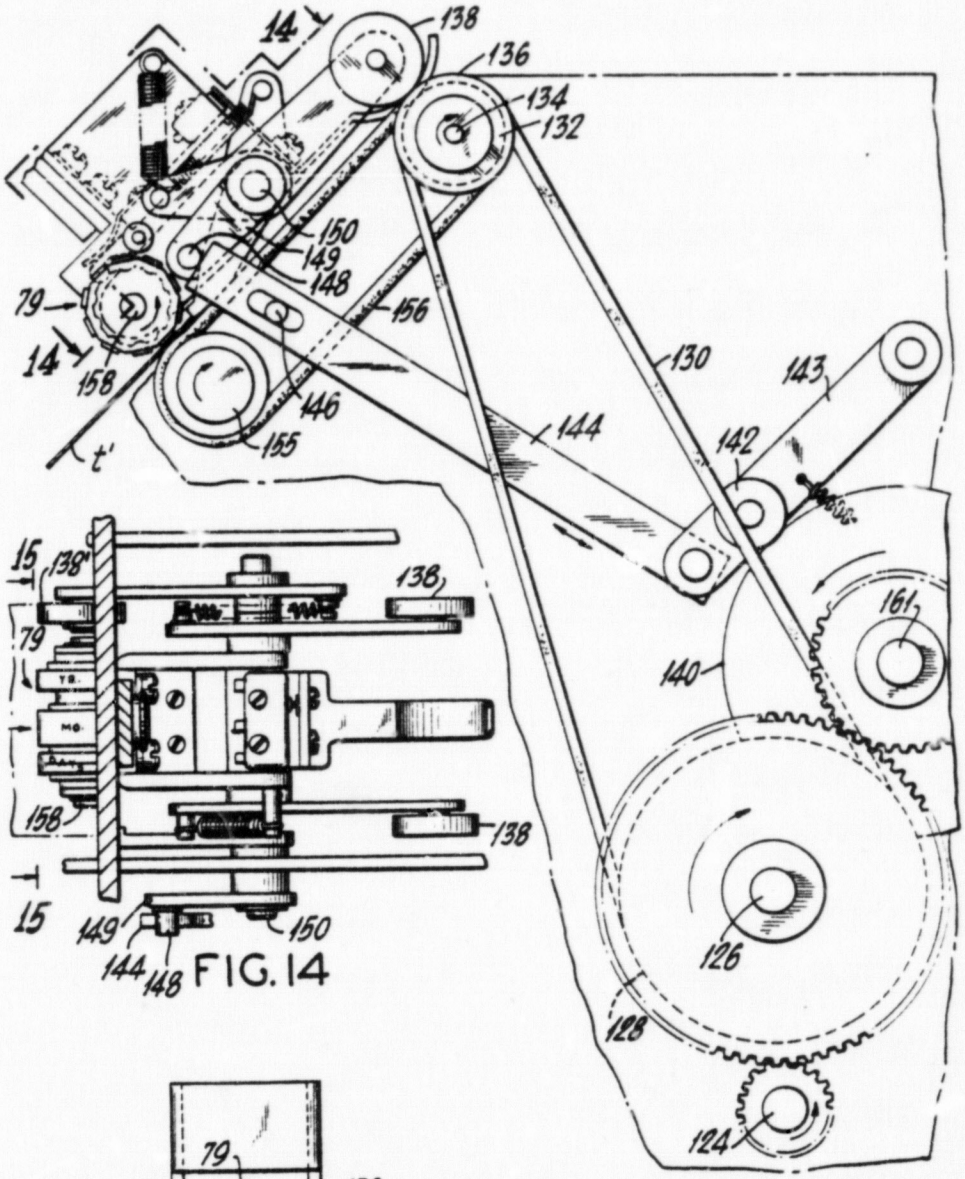


FIG. 13

FIG. 14

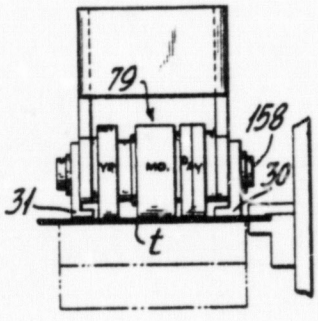


FIG. 15

INVENTOR.
ALBERT F. HOHMANN
BY S. C. Yeiter
ATTORNEY.

A456

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 8

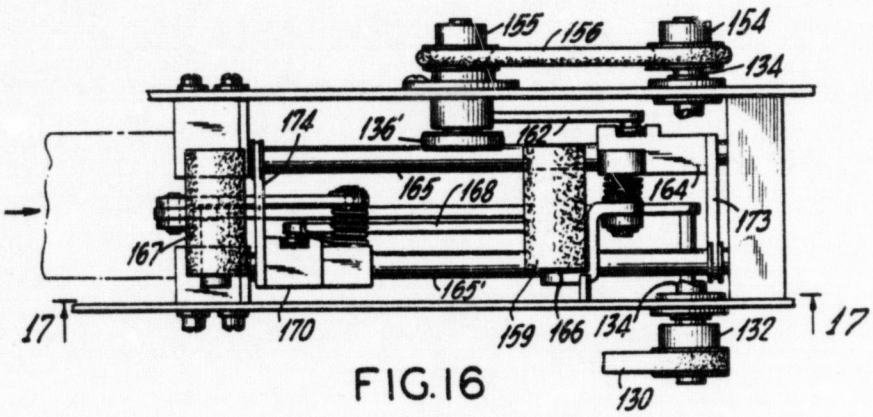


FIG. 16

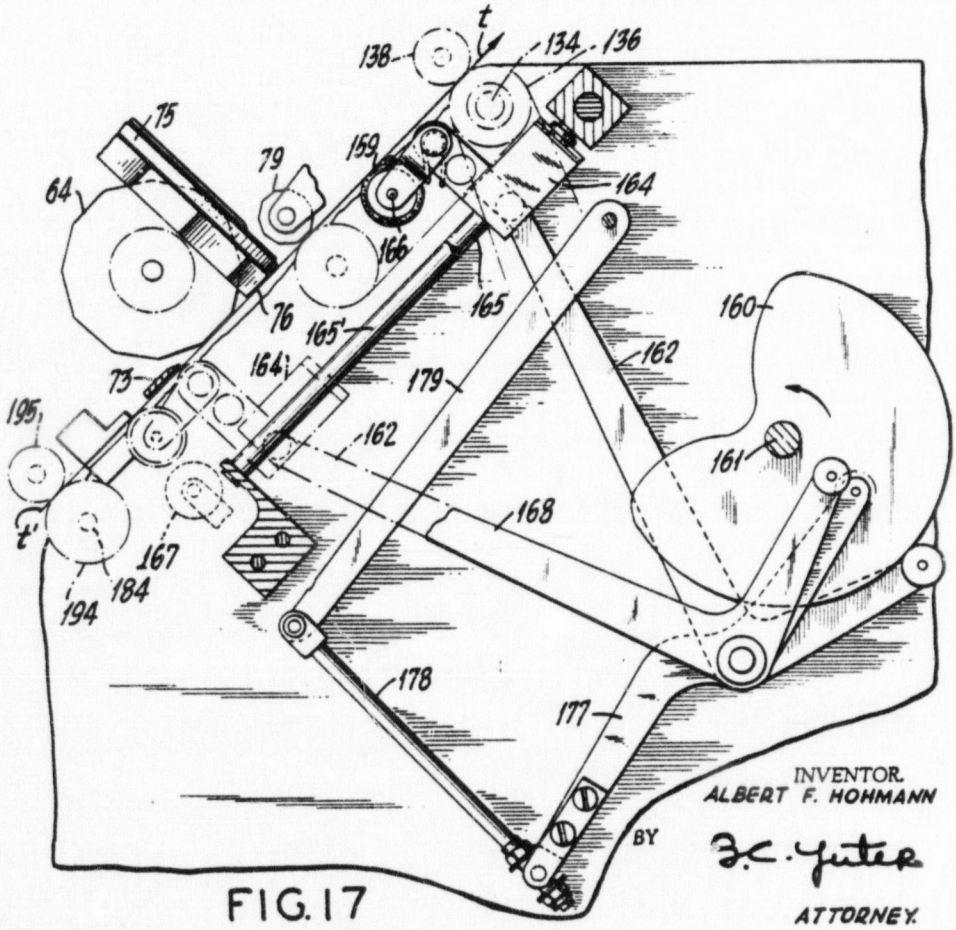


FIG. 17

INVENTOR.
ALBERT F. HOHMANN
BY
ATTORNEY.

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 9

FIG. 18

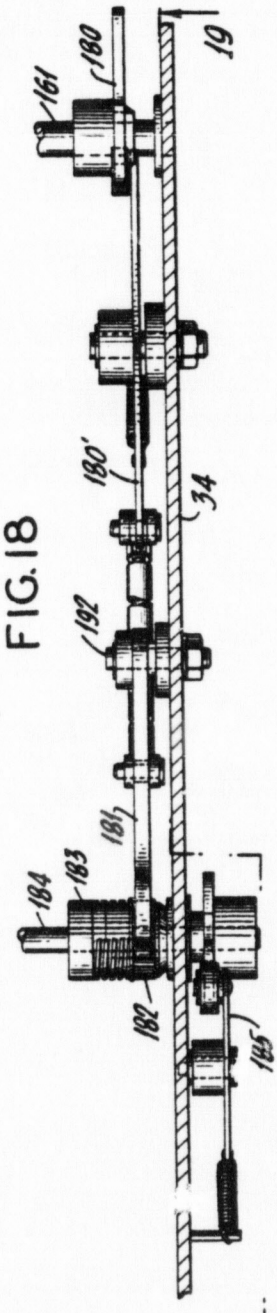
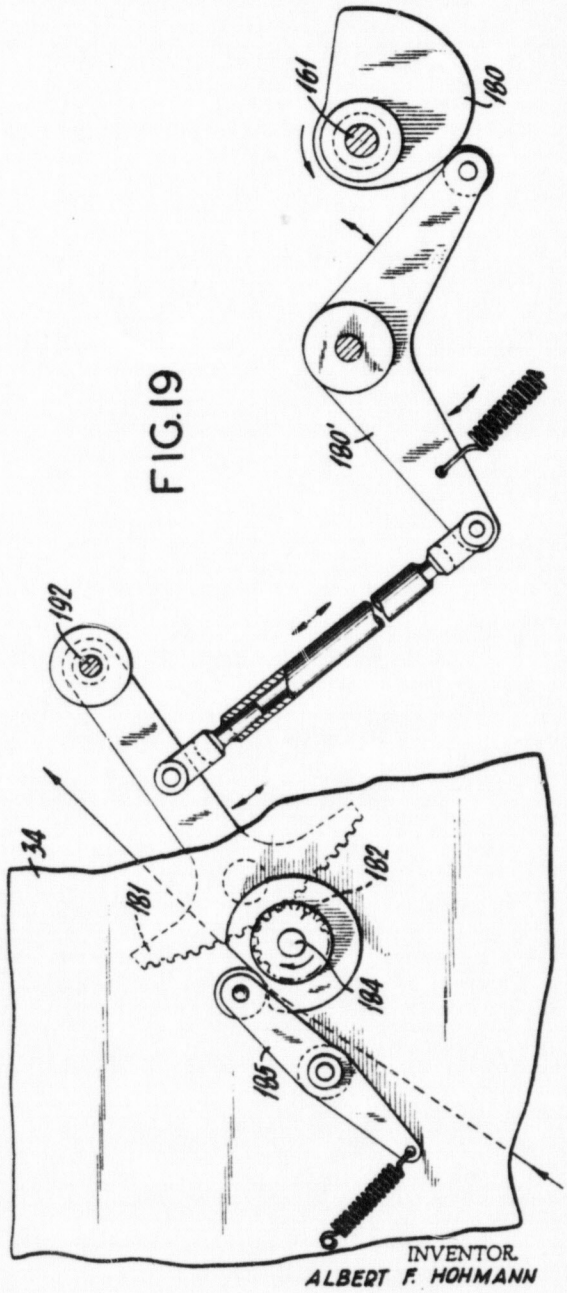


FIG. 19



INVENTOR.
ALBERT F. HOHMANN

BY J. C. Yuter

ATTORNEY.

A458

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 10

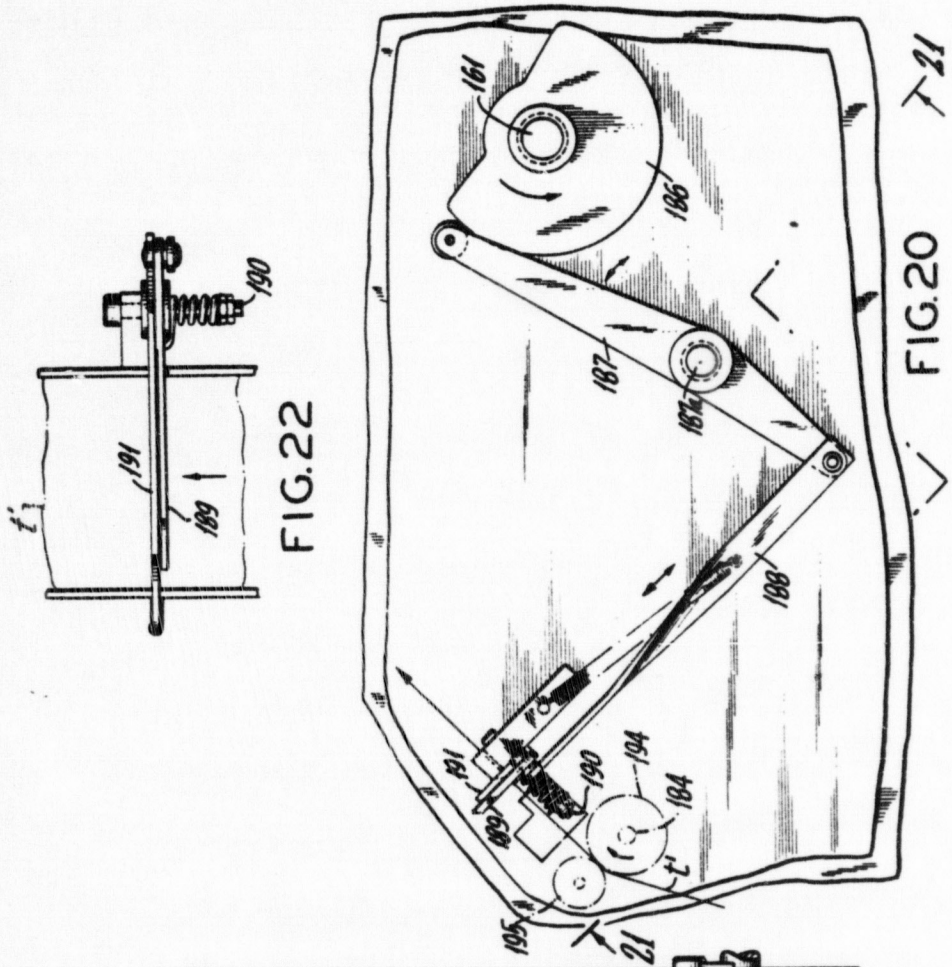


FIG.20

FIG.22

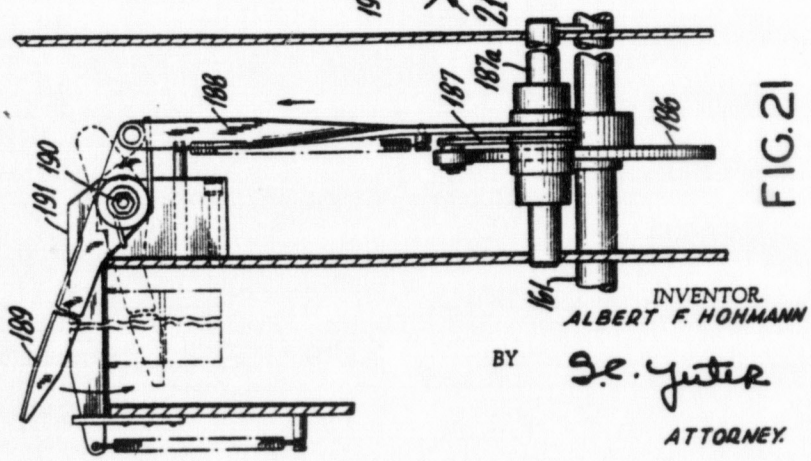


FIG.21

INVENTOR.
ALBERT F. HOHMANN

BY

ATTORNEY.

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 11

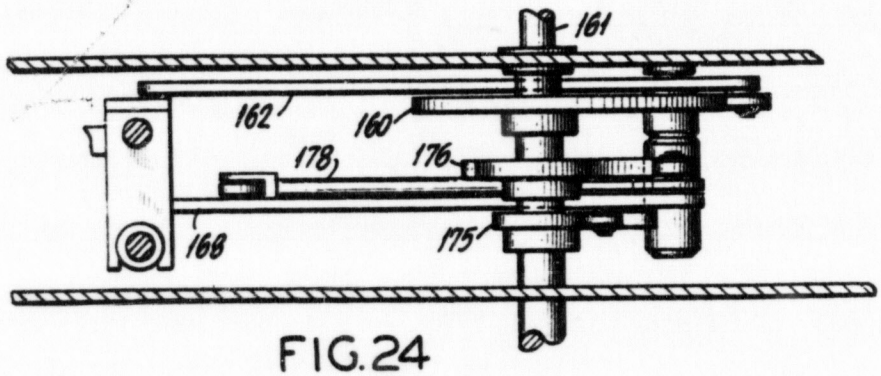


FIG. 24

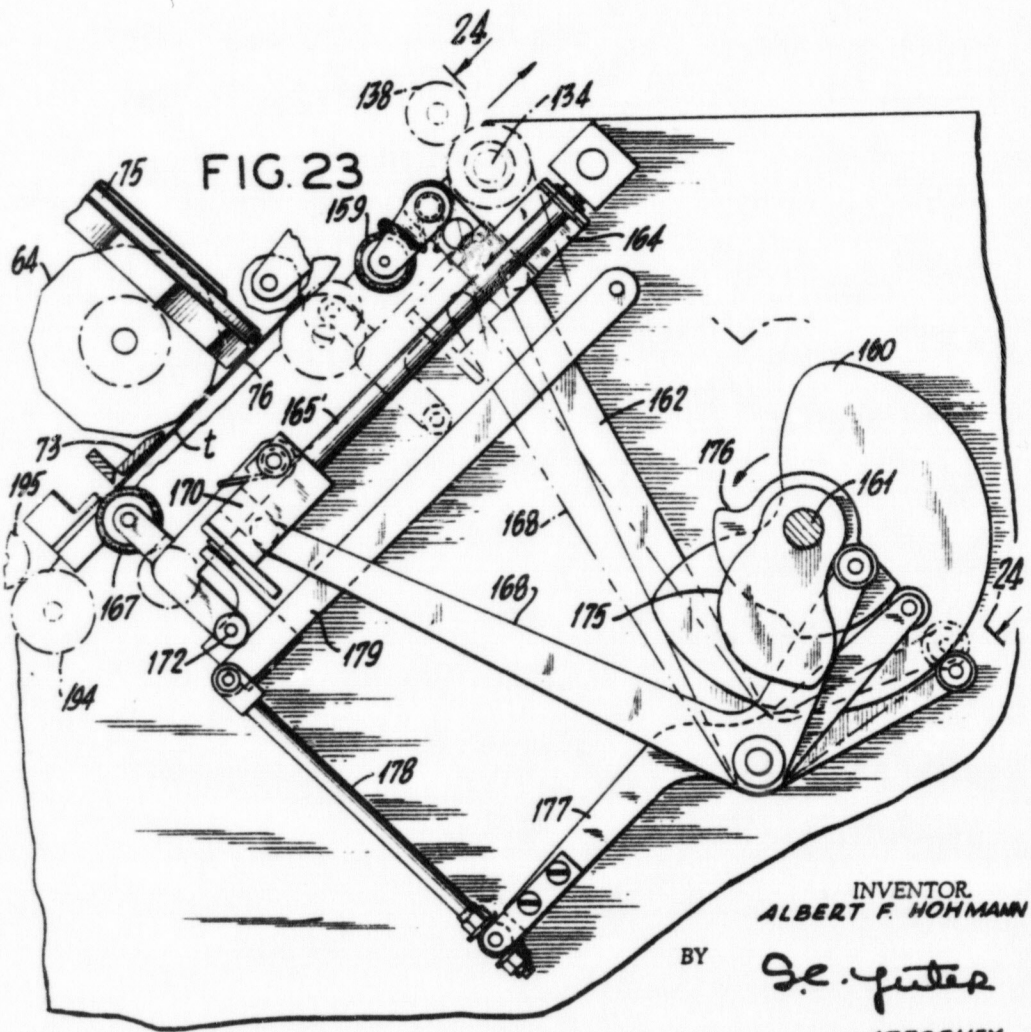


FIG. 23

INVENTOR.
ALBERT F. HOHMANN
BY
ATTORNEY.

A400

June 14, 1966 A. F. HOHMANN 3,255,692

TICKET PRINTING AND ISSUING DEVICE

Original Filed June 5, 1961 12 Sheets-Sheet 12

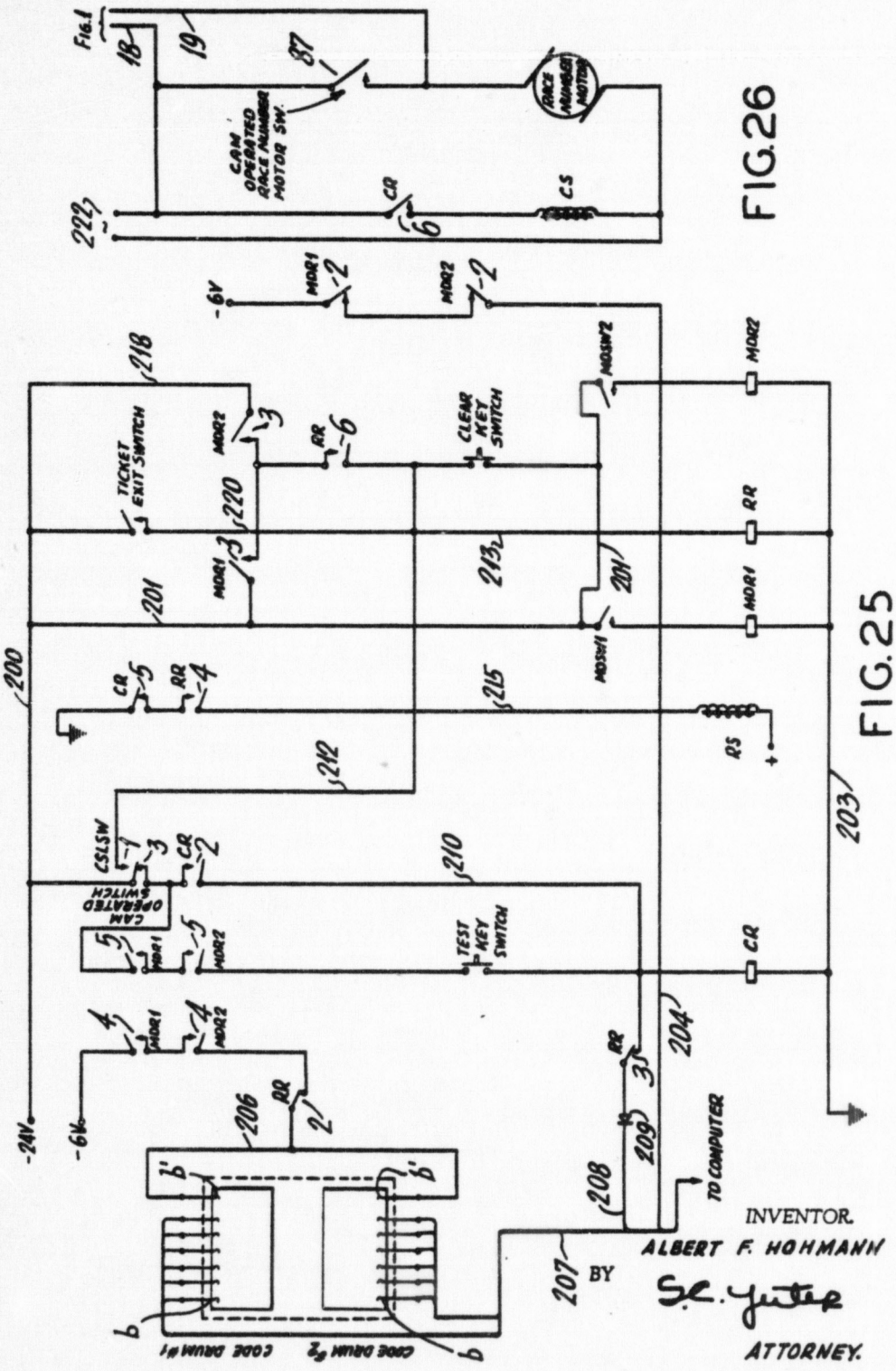


FIG.26

FIG.25

INVENTOR.
ALBERT F. HOHMANN
BY
S. C. Fuller
ATTORNEY.

United States Patent Office

3,255,692

Patented June 14, 1966

3,255,692

TICKET PRINTING AND ISSUING DEVICE

Albert F. Hohmann, Hackensack, N.J., assignor to Digitronics Corporation, Albertson, N.Y., a corporation of Delaware

Original application June 5, 1961, Ser. No. 115,018. Divided and this application July 15, 1964, Ser. No. 384,040

8 Claims. (Cl. 101—66)

This is a division of application Serial No. 115,018, filed June 5, 1961, now abandoned.

This invention relates to an improved keyset-controlled ticket printing and issuing device which generates different coded signals respectively corresponding to different items of digital data represented by the tickets for entry into a pari-mutuel or other computing apparatus for totalizing and other purposes.

The device of the instant invention may be employed for printing and issuing tickets for trains, airlines, and other transportation companies, theatres and the like, but is especially suitable for issuing tickets at the betting windows of pari-mutuel race tracks. The devices now employed at race tracks generally involve a large number of electrical relay circuits with numerous make-and-break contacts, for selection, printing and other purposes, and such circuits require continual adjustment, cleaning and other maintenance and increase the possibility of trouble or failure. The consequences of any such failure, particularly at race tracks, are indeed serious.

An object of the instant invention is to provide a keyset-controlled ticket printing and issuing device of the character disclosed, in which the various moving parts are positively actuated and positioned by interlocking mechanical members, and in which the use of a large number of relay circuits and contact elements is not required for the various keyset operations including the generation of item data signals for application to a computer.

Another object is a keyset of the foregoing character which is extremely rugged, reliable and accurate, and which may be produced and sold at a lower price than the former devices which utilize a large number of electrical components.

A further object is to provide suitable means for preventing the issuance of a ticket unless and until the signals representing the data on the ticket have been received by the associated computer; more specifically, the keyset will not issue a ticket until a revertive control signal has been received from the computer apparatus.

An additional object is a keyset device having improved structure for selecting and properly positioning any of a plurality of different characters on a printing wheel for producing tickets respectively representing different items, and for generating code signals representing the currently selected item.

Still another object is the provision of a keyset of the foregoing character having a rotatable signal coding device for producing a code signal representing the currently selected item, in which the print wheel and coding device remain positively engaged whereby the input from an operated key to the print wheel and coding device is not discontinued at any time.

Another object is a keyset particularly adapted for race track use, and which has a race code print wheel for printing on the issued tickets the identifying number and code of each of the races, which print wheel may be controlled from outside the keyset by an incoming circuit adapted to turn all of the race number wheels simultaneously in all of the various keysets at the track to identify the next race, thereby obviating the necessity of opening up a large number of keysets (several hundred at a large track) and

manually changing the coding print slugs before each race as generally required with existing systems.

A still further object is a keyset-controlled ticket printing and issuing device for race track use, which may readily be converted from a device for issuing only "single bet" tickets to one for issuing either "single bet" or "daily double" tickets as desired, and vice versa.

Other objects and advantages of the invention will be apparent from the following detailed description of an illustrative embodiment thereof, taken in connection of the accompanying drawings in which:

FIG. 1 diagrammatically shows a plurality of keysets for issuing betting tickets at the various Win, Place and Show betting windows at a pari-mutuel race track, and for simultaneously sending the betting information to a pari-mutuel computer;

FIG. 2 shows one of the keysets enclosed in its housing, and having two rows of manually operable keys for enabling "daily double" betting tickets to be issued;

FIG. 3 shows the various data items and information appearing on a printed daily double ticket as issued by the keyset;

FIG. 4 is a view, in elevation, of certain of the keyset mechanisms, looking inward from the right hand side of the keyset of FIG. 2, with the side plate removed;

FIG. 5 is a timing chart of the ticket printing and issuing operations;

FIG. 6 shows certain details of the key-lever mounting structure for the upper row of keys;

FIG. 7 is a view, in elevation, taken along the line 7—7 of FIG. 6;

FIG. 8 shows details of the key-controlled selecting levers, selection stop pins and other mechanical members for stopping and rigidly holding the print wheels in fixed positions while printing the identification numbers of the respective horses on which the bets are placed, as well as the identifying numbers of the successive races;

FIG. 9 is a view partly in section, taken along the line 9—9 of FIG. 8, showing details of the selection drums and signal coding drums employed, with drive means for rotating the drums;

FIG. 9*a* is a fragmentary view of certain of the electrical contact brushes that engage the signal coding drums for sending signals to a pari-mutuel computer;

FIG. 9*b* is a detail of back-stop ratchet and pawl elements seen in FIG. 9;

FIG. 10 is a diagrammatic view of the driving gear trains for the selection drums and signal code drums of FIG. 9;

FIG. 11 is a view taken along the line 11—11 of FIG. 8, looking in the direction of the arrows;

FIG. 12 is a sectional view taken along the line 12—12 of FIG. 8, and showing the horse identification wheels for printing daily double tickets;

FIG. 12*a* is a modification of the structure of FIG. 12 for printing "regular" or "straight" betting tickets, for which only one horse identification print wheel is required;

FIG. 13 shows mechanism for issuing the printed tickets;

FIG. 14 is a view, partly in section, taken along the line 14—14 of FIG. 13;

FIG. 15 is a view taken along the line 15—15 of FIG. 14;

FIG. 16 is a partial top view of the inking mechanism.

FIG. 17 is a side view taken along the line 17—17 of FIG. 16, showing certain details of the inking mechanism;

FIG. 18 is a top view of ticket advancing mechanism;

FIG. 19 is a side view of FIG. 18, looking in the direction of the arrows 19, 19;

FIG. 20 is a side view of cam-operated ticket shearing mechanism;

FIG. 21 is a view looking along the line 21—21 of FIG. 20;

FIG. 22 is a top view of the ticket shearing blades of FIGS. 20 and 21;

FIG. 23 shows cam-actuated means for printing the desired data on a ticket;

FIG. 24 is a view taken along the line 24—24 of FIG. 23, looking in the direction of the arrows;

FIGS. 25 and 26 jointly show a local control circuit for the keyset; and

FIG. 27 shows the various data items and information appearing on a straight ticket, as distinguished from a daily double ticket.

FIG. 1 diagrammatically shows a pari-mutuel system for race tracks, comprising a number of keysets KS to KS' which are located at the betting windows for entering the bets before each race, and for issuing the tickets to the bettors. In accordance with the instant invention the moving parts of the keyset device are positively actuated and positioned by mechanical elements to thereby obviate the necessity of having a large number of electrical and electronic elements for selection and printing purposes, and moreover the mechanical elements are adapted to operate at very high speeds; the time required for the successive selection, printing and issuing operations is but a fraction of a second.

The keysets KS to KS' are each connected by a cable 10 or 10' to a high speed pari-mutuel computer which determines the returns to be paid on the winning tickets at the conclusion of each race, each cable including several conductors for transmitting code signals to the computer for entering the necessary data therein, and also two control conductors 12 and 14, as hereinafter explained in detail in connection with the circuit diagram of FIGS. 25 and 26. As indicated in FIG. 1, the conductor 12 is controlled by a relay 16 or other suitable element embodied in the computer. A circuit 18 extends between the various keysets for enabling all of the race code print wheels (which print on the issued tickets the identifying number and code symbol of each race) to be turned simultaneously in all of the keysets to identify the next race, as hereinafter explained.

Referring to FIG. 2, the keyset is enclosed within a metal housing, generally indicated at 24, having hinged front and side plates 24*a* and 24*b* and a removable top plate 24*c*. A keyboard housing or cover 26 extends from the front of the housing 24, and the keyboard shown comprises an upper row *k*1 and a lower row *k*2 of manually operable keys, so the keyset is adapted to issue daily double tickets in which a first horse selection is made by depressing the proper key in the lower row, and a second horse selection made by depressing the proper key in the upper row. The tops of the keys bear numbers which represent the numbers assigned to the various horses in a race. Each printed ticket *t* is ejected through a slot 28 in the top the keyset housing.

FIG. 3 shows a daily double ticket as issued. The name of the track and the price of the ticket (in this case a Two Dollar bet) are printed on a portion A of the ticket. Portion B has printed thereon the identifying numbers of the two horses on which the bet is placed. Portion C has printed thereon the number identifying the race and a code number or character also identifying the particular race; the code number "BLXM1" is printed by means of a type slug which may manually be replaced on different days thereby to make it more difficult for a ticket to be altered illegally or counterfeited. Portion D of the ticket contains the date which is printed by a set of date wheels that are manually changed for each day of the meet. Two special code characters 30 and 31 opposite the date also make it difficult to alter the date illegally or to counterfeit a ticket.

Referring to FIGS. 4, 6 and 8, various details of the keyset mechanisms are shown, FIG. 4 being a view looking inward from right hand side of FIG. 2 with the side plate removed. Reference number 34 of FIG. 4 identifies one of the vertical mounting plates for the equipment; two other mounting plates are positioned behind plate 34 and hence are not seen in the figure; these plates are bolted together at their upper edges by bolts and spacers in known manner, one of the bolts being indicated at 33 in FIG. 4. A roll of ticket stock *t'* of thin cardboard is rotatably mounted on a rod 35 which is supported in any suitable maner, the ticket strip being advanced past the various print wheels and severed into ticket lengths for issuance.

The key levers 36 are pivotally mounted on rods 38 carried by fixed frame plates. The key levers have tail portions, seen at 36*a* in FIG. 6, with small studs 42, FIG. 8, for engagement with the ends of associated selecting levers 44. Selecting levers 44 are pivotally mounted intermediate their ends on rods 46 carried by brackets 48 and 48', seen more clearly in FIG. 8. In this figure one of the keys *k*1 of the upper row of keys is shown depressed, which indicates that one of the horses has been selected for a daily double bet; the lower keys *k*2 are seen in their unoperated positions, indicating that the second horse has not yet been selected. Small coil springs 40 normally bias the keys to their unoperated positions; when a key is manually depressed by a ticket seller, however, it is held down by latch members seen in FIG. 7 until the bet has been registered in the pari-mutuel computer, as hereinafter described. Each selecting lever has an individual coil spring 45 which causes the lever to turn in a clockwise direction, as viewed in FIG. 8, when the associated key is depressed, and this causes the lever to move into the path of a corresponding stop pin 59 that extends from the surface of a rotating selection drum 57 or 58. The lever engages the stop pin and stops the drum in a position corresponding to a particular selected horse and the identification number of the horse is printed on the ticket by a print wheel that rotates in unison with the selection drum hereinafter referred to.

The arms 48 and 48' respectively are embodied in brackets pivotally mounted on fixed rods 50 and 50', and these brackets are biased by coil springs 56 so that the lower ends of the arms are biased against fixed stop pins 54. Pins 54 and 54' fix the limits of a slight swinging or arcuate movement of the lower ends of the bracket members 48 and 48'. Each selection drum and print wheel are continuously rotated on a shaft driven through a slip clutch from a continuously rotating drive shaft, the slip clutch enabling the selection drum and print wheel to be stopped when a selection is effected, notwithstanding the continued rotation of the drive shaft. The operation of the foregoing assembly of the selecting arms and brackets is advantageous in that it prevents movement of the print wheel during a printing operation and thus prevents smudging of a ticket and provides a clean sharp impression of the printed data, in the following manner: The force exerted on the end of a selecting lever in engagement with its associated stop pin on the selection drum due to the continued rotation of the drive shaft causes the associated bracket 48 or 48' on which the lever is mounted to be urged against its forward stop pin 54' and thus firmly hold the print wheel against movement during a printing operation, and prevent jiggling of the wheel. Preferably, and as shown in FIGS. 9 and 9*b*, a ratchet and back-stop pawl arrangement is used with the driven shafts to prevent any rebound of the selection drum and print wheel when these members are stopped by the selection levers and stop pins. The bracket arms 48 and 48' have extensions 49 and 49' which respectively actuate two microswitches MDSW1 and MDSW2 mounted on a fixed rod 68 to close circuits which indicate to the computer that selections have been set up in the keyset; these switches are actuated to their circuit-closing positions just at the instant that each of the bracket arms has engaged its stop pin 54'. The switches are referred to as Motion Detector switches and their operation explained in the description of the keyset control circuit of FIGS. 25 and 26 appearing hereinafter.

FIGS. 8 to 10 show details of the two selection drums and driving shafts therefor. As shown in FIG. 8 the drum **57** is mounted directly above the drum **58**; in FIG. 9 the view is taken at an angle such that one drum does not obscure the other in the figure; and FIG. 10 is a diagrammatic representation of the drums and their driving elements. Preferably, and as shown, the stop pins **59** on each drum are arranged in a helical path so that during rotation of the drums each pin will be in alignment with its corresponding stop lever for engagement with the lever when its associated key is actuated. Referring now to FIGS. 9 and 10, the drums **57** and **58** respectively are mounted on and rotated by shafts **65** and **66** which in turn are driven through friction slip clutches **67** and a gear train **69** from the drive shaft of a continuously running motor M1 energized from alternating current power.

Two signal code drums **77** and **78** are mounted on and rotated by the shafts **65** and **66** on which the selection drums are mounted. The code drums are signal-generating devices operative in successive angular positions thereof for producing different code signals respectively representing the items of data as determined by the manually operated keys, and printed on the issued tickets such as the ticket shown in FIG. 3. The signal code drums illustrated have successive longitudinally extending rows of interspersed conducting and nonconducting areas coded to produce binary permutation code signals when these areas are in contact with a row of brushes. These may conveniently be provided by metal drums with inserts *i* of insulation embedded in the surfaces of the drums and arranged to provide the spacing code pulses of permutation code signals, the marking code signal pulses being obtained from the conductive surface areas *c* of the drums in contact with the rows *b* and *b'* of the brushes diagrammatically shown in FIGS. 9*a* and 25. Separate conductors from the brushes are embodied in a cable **10** or **10'** for convenience, as seen in FIGS. 1 and 25, and transmit to the pari-mutuel signals representing the data to be entered in the computer. It will be understood that other known forms of rotatable signal-generating devices may be used instead of the drums, and that other signal codes may be employed for transmitting the data.

The ratchet and back-stop pawl arrangement hereinbefore referred to for preventing rebound of the selection drums and print wheels is provided by a ratchet **70**, FIGS. 9 and 9*b*, firmly secured in any suitable manner to each driven shaft **65** and **66**, pivotally mounted on a fixed pin **72** secured to frame structure with a coacting spring-pressed back-stop pawl **71**. Print wheel **63** is connected to the shaft **61** through a gear train **62**, FIG. 10, and print wheel **64** is connected to the shaft **61** through a gear train **62'**. The teeth of each ratchet respectively correspond to the successive print positions of the associated horse identification print wheel **63** or **64**, and when a selecting lever is engaged by a corresponding stop pin to stop the rotating members, one of the teeth of the ratchet wheel **70** will always appear at the corresponding rotary position and the spring-actuated pawl will instantly enter behind the ratchet tooth and prevent rebound of the associated selection drum and print wheel.

The relative positions of the printing type faces in the area where printing of the ticket occurs are seen in FIGS. 8, 17 and 23. Looking from left to right in these figures, these faces are (1) the print slug **73**, for portion A of the ticket of FIG. 3; (2) the faces of the two adjacent wheels **63**, **64** for the two identification numbers of the horses, portion B of the ticket; (3) the slug **76** on race code number wheel **75** which rotates on shaft **74**, portion C of the ticket; and (4) the manually settable date wheel assembly **79**, shown in detail in FIGS. 14 and 15, for printing portion D of the ticket. The word "AND" in portion B of a daily double ticket may be carried by either of the two horse identification wheels, for example, on a slightly wider wheel **63** seen in FIG. 12. In the latter figure, one of the wheels **64** is pinned to shaft **61** which is rotatable by the gear train **62'**; wheel **63** is rotatable on the shaft **61** and is positioned by the gear train **62**.

FIG. 11 shows details of means for stepping the race code number wheel **75** between successive races. The figure shows the relative positions of the parts at the end of a stepping cycle. During a stepping cycle a shaft **80** of an alternating current motor M3 rotates an eccentrically mounted cam **82**. The cam carries a pin **86** which engages the switch arm **84** of a microswitch **87** to open the switch contacts at the end of a stepping cycle. The motor is energized for each stepping cycle by the manual closure by an attendant of a switch **20** (FIG. 1) at a central control point, for example, near the pari-mutuel computer, to supply alternating current over a circuit **18** for a short period of time to start the motor M3 of FIG. 11. As soon as the motor starts, the cam **82** starts to rotate and the pin **86** releases the switch arm **84** and the microswitch snaps into its circuit-closing position and its contacts maintain a supply of alternating current to the motor to insure that it continues in rotation until the end of the stepping cycle, whereupon the switch **87** is again opened by pin **86** on the cam **82**, thereby deenergizing the motor. The motor is of a well known type having a brake solenoid to insure quick stopping when the current supply circuit is opened by the switch.

Stepping of the wheel **75** during a rotation of cam **82** is effected by a cam follower roller **88** on an actuating arm **90** pivoted at **91**, the cam follower being held against the cam by a spring **92**. An actuating pawl **96**, pivotally mounted at **94** to lever **90**, is in engagement with a ratchet wheel **98** that steps the code wheel **75** to the next printing position when motor M3 is energized as aforesaid, all of the keyset devices having their race code number wheels simultaneously stepped by remote control for the race code of the next race to be run. A detent arm **100**, pivoted at **101**, carries a roller **102** which, when the wheel **75** reaches the next printing position, engages one of the detents **104'** in the periphery of a circular detent plate **104** secured to the wheel **75**. A spring **105** urges the arm **100** and roller **102** into latching position, and the wheel is firmly held against movement during a printing operation.

FIG. 12*a* shows a horse identification print wheel assembly for issuing regular or straight tickets, as distinguished from daily double tickets. Print wheel **110** contains the print type for the various horse numbers, and preferably a type slug **112** is provided to print a notation, for example "No.," on a regular ticket, as seen in FIG. 27, so that an additional horse number cannot illegally be inserted to simulate a daily double ticket. The slug may be held in any suitable manner, as by the shaft **61**, the slug being held from rotation by the shaft by a cap screw or bolt **113** that passes through a fixed frame plate **114**. It will be understood that only one row of keys is required in the keyboard, such as the row *k1* seen in FIG. 6 (in which the second row *k2* does not appear in the view), and that only one selection drum, signal code drum, and associated elements are required. The ticket printing and issuing device may readily be converted during the assembly thereof to provide for the issuance of only regular tickets or only daily double tickets, as desired.

FIGS. 4 and 13 show mechanism for feeding out the printed tickets from the keyset device. A constantly rotating main motor M1, indicated in dotted outline in FIG. 4 and diagrammatically shown in FIG. 10, rotates a main shaft **124** which drives the mechanism of FIG. 13. Referring to the latter figure, the shaft **124** drives a gear train which rotates a shaft **126** which is continuously rotating. A pulley **128** on shaft **126** drives a belt **130** which in turn drives a pulley **132** on a shaft **134**. The ticket exit roller assembly includes three constantly rotating rubber rollers **136**, one of which is seen in FIG. 13, and three coacting pressure rollers of steel **138** (FIGS. 13 and 14). Feedout of a ticket is effected by

causing the rollers 138 to be actuated momentarily into position to exert pressure on the edges of the ticket directly above the rubber rollers 136 and thus eject the ticket from the keyset device, i.e., from the right hand side of the roller assembly as viewed in FIG. 13. A ticket exit cam 140 mounted on a main cam shaft 161 has a cam follower 142 carried by a pivoted arm 143. The shaft 161 is driven in cycles through a one revolution clutch of known type identified by reference numeral 230 in FIG. 4, when a latch 231 is released by the energization of a clutch solenoid in response to an answer-back signal from the computer, as set forth hereinafter in the circuit description of FIG. 25. The clutch is driven through gears from the shaft 124 of the motor M1 of FIG. 4, and makes one revolution for the cycle of shearing, printing and issuing each ticket, after which the clutch is stopped by the latch 231.

Referring again to FIG. 13, the cam follower arm 143 and cam 140 actuate a link 144 to control a lever arm 149 which has a stud 148 adapted to be engaged by the end of lever or link 144 during its operation. A fixed pin 146 provides a guide pin for the link. The arm 148 is pivoted at, and is pinned to, a transfer shaft 150, as seen more clearly in FIG. 14. The turning movement of shaft 150 at the proper time under control of the ticket exit cam 140 will bring a pressure roller 138', FIG. 14, into pressure contact with the ticket whereby rollers 138' and 136', FIG. 16, feed out the ticket. The rollers 138, FIGS. 13, 14 and 17, are spring-loaded to keep them urged against the lower exit rollers (or the ticket between them) to insure positive ejection of the ticket. A driving pulley 154 on shaft 134 drives a pulley 155 through a belt 156 for rotating the exit roller 136', FIG. 16.

FIGS. 13 to 15 show the date wheel assembly 79 composed of year, month and day printing wheels mounted on a fixed shaft 158, the wheels being manually settable to show the date of issuance of a ticket which is the race date. FIG. 15 shows two print slugs 30 and 31 for printing the special code characters opposite the date and seen in the ticket of FIG. 3. These slugs are mounted on the ends of the shaft 158, but are pinned or otherwise secured against any rotational movement.

FIGS. 16 and 17 show mechanism for operating the inking roller 159. An inking cam 160 is operated in cycles by the main cam shaft 161 for controlling a cam follower arm 162. Prior to an inking operation the position of the arm is at the left; the figure shows the arm at the right which is after an inking operation has occurred. A carriage 164 is slidable on a guide rod 165, and the carriage has a bar 173 with a bifurcated end portion that freely slides along another guide rod 165' and prevents turning of the carriage as it is slid along the rod 165. The carriage 164 carries the ink roller 159 which is freely rotatable on a shaft 166. The roller is of felt or other suitable material and will retain a sufficient supply of ink to last for days.

A printing carriage 170 is slidably mounted on the guide rod 165', and carries a rotatable print roller 167 seen in FIGS. 16 and 23. The carriage has a bar 174, FIG. 16, with a bifurcated end portion that freely slides along the guide rod 165 and prevents turning of the carriage as it is slid along the rod 165'. In FIG. 23 there are shown a cam 175 and a cam follower arm 168 for moving the print carriage across the print field, the cam being rotatable by the shaft 161 during a print cycle. Shaft 161 also carries a pressure cam 176 which causes a cam follower 177 that acts through an adjustable link 178 to exert upward pressure on the end of a pivotally mounted arm 179. A roller 172 riding on the arm 179 causes upward pressure to be exerted on the rubber print roller 167 and hence on the under side of a ticket *t* to press the ticket against the type faces to effect printing. The cam follower arm 168 is shown in full line before printing, and in dot and dash outline at the end of a printing operation.

FIGS. 18 and 19 show mechanism for advancing the ticket stock into position for printing. This comprises a ticket stock feed-in cam 180 rotated by the shaft 161 during the feed-in cycle. A cam follower 180' acts through an adjustable link to turn a gear 181, pivotally mounted at 192, through a limited arcuate movement. Gear 181 meshes with a gear 182 that is pinned to a collar 183, FIG. 18, forming part of a one direction clutch of known type which permits shaft 184 to rotate in only one direction. A detent device 185 prevents back lash. The ticket stock feed roller of rubber is keyed on the shaft 184 and is identified by reference numeral 194 in FIG. 20. A pressure roller 195 coacts with the roller 194 to feed in a predetermined length of the ticket stock *t'* sufficient to form a ticket.

FIGS. 20 to 22 show means for cutting or shearing the ticket stock to form the tickets. A cam 186 for operating the shearing mechanism is rotated by the cam shaft 161, and through cam follower arm 187, pivoted at 187*a*, operates a link 188. The link is pivotally connected to a movable shearing blade 189 pivotally mounted at 190 and which coacts with a fixed shearing blade 191. Blade 189 cuts as it is moved upwardly; the cutting edge of 189 is its upper edge as viewed in FIG. 21, and the lower edge of 191 is its cutting edge.

As may be noted from the ticket issue time chart of FIG. 5, prior to a printing operation the movable shear blade 189 is up (as seen in FIG. 21). In the sequence of operation the type faces are inked by the roller 159 which remains for a period over at its right-hand position, as viewed in FIGS. 16 and 17, since its cam follower 162 is on the dwell portion of the cam 160. The movable shear blade is now brought down to the dotted line position shown in FIG. 21. The ticket strip is then fed in, and blade 189 is quickly moved up to cut the ticket, the blade remaining up. The print roller 167 is then raised up against the ticket and moved across to the right to effect printing. The print roller is then brought down and returned back to the left, and the ticket is ejected, and the inking roller 159 is returned to its initial position. In the chart the numerals above the various chart lines represent degrees of rotation, and the numerals below the chart lines represent time intervals in milliseconds.

FIG. 7 shows suitable mechanism for latching the operated keys of the keyboard and for releasing the operated keys in repsonse to an answer-back signal from the computer in the manner referred to in the description of the circuit drawing of FIG. 25. In FIG. 7 it is seen that each key lever has a pin 240 which engages an associated latch arm 242, the latch arms of the key levers being secured to a rod 244 and rotatable therewith. The lower end of each latch arm has a cam surface which bears against the pin 240 when the key is unoperated. When a key is depressed the pin in its key lever causes the latch assembly to rotated slightly in a counterclockwise direction, against the tension of a biasing spring 247, until the pin 240 enters a notch or shoulder portion 246 and the latch returns to hold the key lever down. A link or arm 248, with the left-hand end thereof secured to the pivotal rod 244, and the right-hand end thereof pivoted on a stud 249, operates to rotate the rod 244 and release the latches 242 when an arm 252 is raised up by rotation of an arm 250 of the Reset Solenoid RS, and thus release any operated key. The key lever seen in FIG. 7 is the CLEAR lever and it operates a CLEAR KEY SWITCH for purposes explained hereinafter.

In order to prevent more than one key in each bank of keys from being operated at any one time, the key levers coact with steels balls 260 contained in a channel 262, as seen more clearly in FIG. 6. The diameter of each ball is such that only one key lever may be entered between adjacent balls at any one time. Other means for preventing the operation of more than one key at a time may, of course, be employed.

Keyset control circuit

FIGS. 25 and 26 together comprise a schematic circuit diagram showing the controls for the keyset adapted to issue "daily double" betting tickets. It will be seen that the circuit operates with relatively few relays and electromagnets, and this reduces the possibility of electrical trouble or failure. In the diagram the relay contacts are shown detached from the relay windings to simplify tracing the circuits; the relay windings are given letter designations generally indicating their functions, and their associated contacts are identified by the same letter designations as the relays, followed by a number of identifying the individual contacts.

The manual operation of a key in each of the two rows of keys will cause the associated selecting levers to move into the paths of their corresponding stop pins on the selection drums to stop the drums, and hence stop the two code drums Nos. 1 and 2 (diagrammatically shown in the left-hand portion of the figure) in proper position for producing the code signals representing the identifying numbers of the two horses selected by a bettor for the daily double in the coming race.

As each of the selection drums is stopped, the force exerted on the operated selection lever causes a bracket member to rotate to a position where it actuates an associated microswitch, referred to as Motion Detector Switches #1 and #2 (MDSW1 and MDSW2). As each MDSW operates, it in turn operates an associated Motion Detector Relay MDR1 or MDR2 over a circuit comprising a bus **200** and a conductor **201**, through the closed contacts of the microswitches and the windings of the motion detector relays to a grounded bus **203**.

When the first motion detector relay MDR1 operates, it opens the normally closed contacts **2** of MDR1 and removes a negative potential of −6 volts normally applied to a conductor **14** which is an outgoing circuit leading to the computer and used to signify that a number representing a particular horse in the coming race has been set up in the keyset. When the conductor **14** has −6 volts potential thereon, this indicates to the computer that the keyset is available for entering a bet, and when the conductor is opened at contacts **2** of MDR1 or MDR2 this indicates to the computer that the keyset is in the process of entering a bet. The operation of MDR1 also closes one pair of contacts **4** in a series circuit comprising two pairs of such contacts on MDR1 and MDR2 and leading to a conductor **206** which is common to the two signal code drums #1 and #2. When both motion detector relays are operated, by a daily double selection set up in the keyset, both pairs of contacts **4** are closed and the common conductor **206** applies signal current of −6 volts through the contact brushes *b'* to the bodies of the metal drums for sending out the code signals from the longitudinally extending rows of coded conducting and nonconducting areas on which the rows *b* of contact brushes rest in the selected stopped positions of the drums. The number of coded areas in each row across the drums engaged by the brushes *b* will depend upon the number of permutation code signals required for the maximum number of horses in any race; the six brushes indicated in each row for coding purposes will give a corresponding number of useful unique permutations.

As soon as the computer has received and accepted the code signals transmitted over conductors in a cable **10**, it energizes a relay **16**, FIG. 1, associated with the calling keyset, and the closure of the relay contacts causes an answer-back, or revertive control, signal of negative polarity to be sent over conductor **12** and through the closed contacts RR3 of a release Relay RR to energize a Clutch Relay CR. A diode **209** in conductor **12** prevents feedback from the keyset circuitry. CR operates and closes its contacts CR6, FIG. 26, to energize the Clutch Release Solenoid CS which releases the latch **231**, FIG. 4, and starts the one revolution clutch operation to effect printing and ejection of the ticket.

Energized relay CR closes its contacts **2** to provide a self-locking circuit comprising a conductor **210**, closed contacts **2**, and the normally closed contacts **3** of a cam-operated switch CSLSW which is controlled by a cam on one of the driven shafts of the keyset device. Relay CR is locked up until the cammed switch CSLSW operates momentarily, towards the end of the operating cycle, which action opens the locking circuit **210** and releases CR and, through the blade and upper contact **1** of CSLSW and conductors **212** and **213**, energizes a Release Relay RR. The operation of RR at its contacts RR2 immediately opens the Code Drum circuit **206**, and at its contacts RR3 opens the answer-back circuit **12**. At its contacts RR4 the operation of the release relay energizes, over conductor **215**, the Release Solenoid RS, but only if the Clutch Relay has been released and its contacts CR5 are closed.

The operated release relay RR provides its own holding circuit at its now closed contacts RR6 so long as contacts **3** of motion detector relay MDR1 or MDR2 remain closed, the holding circuit including conductors **201** and **218**. The basic function of the release relay RR is to operate the release solenoid RS which, in turn, releases the operated key or keys and permits the selector drum or drums to resume their rotation. As each key is reset, the associated switch MDSW releases and deenergizes the associated relay MDR1 or MDR2 and opens each of the two holding paths **201** and **218** for the release relay RR.

When both keys are reset, and both drums are spinning again, Relay RR is released, unless a ticket jam has occurred, in which event RR is held operated over conductor **220** and the EXIT SWITCH which closes until the jam has been cleared. The resetting of both of the keys recloses the series circuit **204** of MDR1 and MDR2 to indicate transmission completed and machine reset. During a jam, since release relay RR is operated and its contacts RR2 are open, no code signal can be sent. This means that no acknowledgment will be received, and no printing can occur.

In the event that a ticket seller operates an "inoperative" key, that is, one for which there is no corresponding horse entered in the race, or if a corresponding horse has been scratched so that the computer cannot send a confirm signal, the closure of the contacts of a CLEAR KEY SWITCH by the operator causes current from the bus conductor **200**, conductor **201**, through the key, and conductor **213** to energize the release relay RR and restore the key to its unoperated position.

The operation of the TEST KEY, by mechanical linkage, stops both Code Drums #1 and #2 each in a position such that a "disallowed" signal appears on the drums, and is recognized by the computer as such so no confirm signal is given by the computer. The word "Test" or equivalent designation appears in one of the print positions on the print wheels bearing the horse designations, and the test designation will be printed on an issued ticket for test purposes without involving the computer. The circuit of the Test Key includes the winding of the clutch relay CR, closed contacts of the test key, closed contacts **5** of MDR1 and MDR2, and the closed contacts **3** of the cam-operated switch CSLSW.

FIG. 26 shows a circuit for enabling all of the race number wheels **75** to be stepped simultaneously before each race. The alternating current power supply **222** is normally not applied to motor M3 (shown in detail in FIG. 11) since the contacts of the cam-operated switch are normally held open. Prior to each race, however, an attendant at the console of the pari-mutuel computer closes the switch **20**, FIG. 1, for a short interval of time and this supplies the alternating current power to the motors M3 of all the keyset devices, over conductors **18** and **19**, to start the motors for the stepping operation,

after which the cam-operated switches 87 close their contacts to maintain power to the motors to complete their stepping operation, whereupon their associated cams again open the switches 87 to stop the motors.

The embodiment disclosed herein is for the purpose of illustrating the principles of the invention and one mode of application thereof, and various changes and modifications may be made without departing from the spirit of the invention which is not to be regarded as limited except as indicated by the scope of the appended claims.

What is claimed is:

1. A keyset-controlled ticket printing and issuing device comprising a set of manually operable keys respectively representing different items of data to be printed on the tickets as issued, means for holding a supply of ticket stock, a print wheel having a series of print characters thereon for printing said different items of data on the tickets, a rotatable selection member having a series of stop pins respectively corresponding to said keys, drive means including a continuously rotatable shaft and a slip clutch for rotating said selection member and print wheel in unison, said keys having associated selecting levers normally positioned out of the path of travel of said stop pins and each movable into the path of a corresponding stop pin when the associated key is operated to stop the rotating selection member and printing wheel in proper position to print the data represented by the operated key, said slip clutch enabling these members to stop notwithstanding the continued rotation of said shaft, means for advancing a predetermined length of ticket stock into the printing position, means for severing the advanced length of ticket stock to form a ticket, means for causing the selected data on the printing wheel to be printed on the ticket, and means for issuing the printed ticket.

2. A keyset device in accordance with claim 1, in which said selecting levers are spaced laterally in a row and said selection member has a longitudinal axis about which it rotates, said stop pins being positioned around the outer surface of the selection member and axially spaced along the member so that during rotation thereof the pins respectively move into alignment with the selecting levers thereby to cause a particular pin to engage the selecting lever of an operated key for stopping the selection member and printing wheel in position to print the selected data item.

3. A keyset device in accordance with claim 2, in which said stops pins are arranged in a spiral path around the outer surface of the selection member to determine the successive stopping positions of the rotatable selection member and printing wheel.

4. A keyset controlled ticket printing and issuing device comprising a set of manually operable keys respectively representing different items of data to be printed on the tickets as issued, a print wheel having a series of print characters thereon for printing said different items of data on the tickets, a rotatable selection member having a series of stop pins respectively corresponding to said keys, drive means comprising a continuously rotatable motor-driven shaft for rotating a driven shaft through a slip clutch, said driven shaft rotating said selection member and print wheel in unison, said keys having associated selecting levers normally positioned out of the path of travel of said stop pins and each movable into the path of a corresponding stop pin when the associated key is operated to stop the rotating selection member and print wheel in position to print the data represented by the operated key, said slip clutch enabling these members to stop notwithstanding continued rotation of said first named shaft, and means for preventing movement of the print wheel during a printing operation comprising a bracket having a rod on which said selecting levers are pivotally mounted, said bracket also being pivotally mounted to provide limited movement thereof between two fixed stop pins, the force exerted on a selecting lever of an operated key by the continued rotation of said first named shaft causing said bracket to be urged against one of its two fixed stop pins and thereby hold the print wheel against movement during printing.

5. A device in accordance with claim 4, including a ratchet wheel on said driven shaft and a back-stop pawl for engaging a tooth of the ratchet wheel in any stopped position of the selection member and print wheel to prevent rebound when these members are stopped by said selection lever and stop pin.

6. A keyset-controlled ticket printing and issuing device comprising a set of manually operable keys respectively representing different items of data to be printed on the tickets as issued, a print wheel having a series of print characters thereon for printing said different items of data on the tickets, a rotatable selection member having a series of stop pins respectively corresponding to said keys, drive means comprising a continuously rotatable motor-driven shaft for rotating a driven shaft through a slip clutch, said driven shaft rotating said selection member and print wheel in unison, said keys having key levers for engaging associated selecting levers and normally operative to hold the selecting levers out of the path of travel of said stop pins and each movable into the path of a corresponding stop pin when the associated key and its key lever is operated to stop the rotating selection member and print wheel in position to print the data represented by the operated key, said slip clutch enabling these members to stop notwithstanding continued rotation of said first named shaft, and means for preventing movement of the print wheel during a printing operation comprising a bracket having a rod on which said selecting levers are pivotally mounted, said bracket also being pivotally mounted to provide limited movement thereof between two fixed stop pins, the force exerted on a selecting lever of an operated key by the continued rotation of said first named shaft causing said bracket to be urged against one of its two fixed stop pins and thereby hold the print wheel against movement during printing.

7. A race track pari-mutuel system comprising: a plurality of keyset devices for printing and issuing tickets prior to each race, each of said keyset devices having manually operable keys and a first print wheel with a first series of printing characters thereon respectively identifying the individual contestants entered in a forthcoming race; each keyset device also having a plurality of mechanically operated selecting members controlled by the operation of a key for selectively rotating said first print wheel to a position for printing on a betting ticket an identifying character representing a bet on a particular contestant; each of said keyset devices also having a second print wheel having race code identification characters thereon for identifying each race; each of said keyset devices also having electrically operated stepping means for stepping each of said second print wheels upon receipt of an electrical signal to a different position, each of said electrically operated stepping means including an electrical motor having a shaft connected to said second print wheel, a cam on said shaft, a cam operated switch operatively disposed with respect to said cam and means for initially energizing said motor in response to the received electrical signal under control of said cam operated switch; and central electrical signal generating means for transmitting electrical signals to the electrically operated stepping means of each of said keyset devices prior to the start of a race.

8. A race track pari-mutuel system comprising: a plurality of keyset devices for printing and issuing tickets prior to each race, each of said keyset devices having manually operable keys and a first print wheel with a first series of printing characters thereon respectively identifying the individual contestants entered in a forthcoming race; each keyset device also having a plurality of mechanically operated selecting members controlled by the operation of a key for selectively rotating said first

print wheel to a position for printing on a betting ticket an identifying character representing a bet on a particular contestant; each of said keyset devices also having a second print wheel having race code identification characters thereon for identifying each race; each of said keyset devices also having electrically operated stepping means for stepping each of said second print wheels upon receipt of an electrical signal to a different position, each of said electrically operated stepping means including an electrical motor having a shaft connected to said second print wheel, a cam on said shaft, a cam operated switch operatively disposed with respect to said cam, a source of electrical energy, circuit means for controlling the transmission of electrical energy from said source to said electrical motor by said cam operated switch and means for transmitting the electrical signal to said electrical motor to initially start said electrical motor, said cam operated switch connecting said electrical motor to said source when said shaft reaches a first position of rotation and disconnecting said electrical motor from said source when said shaft reaches a second position of rotation; and central electrical signal generating means for transmitting electrical signals to the electrically operated stepping means of each of said keyset devices prior to the start of a race.

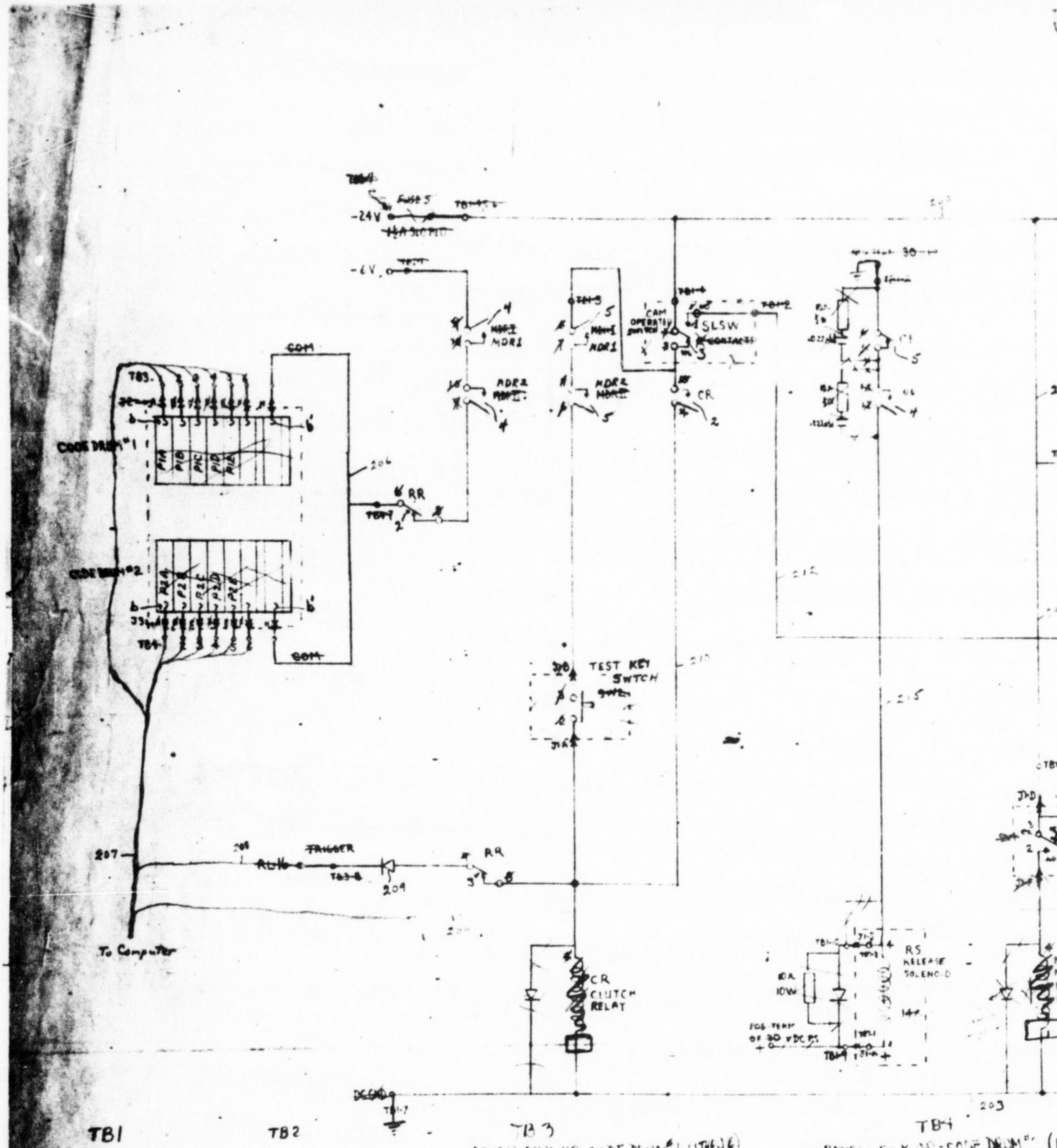
References Cited by the Examiner

UNITED STATES PATENTS

2,526,512	10/1950	Snell et al.	235—92
2,691,342	10/1954	Johnston et al.	235—92

ROBERT E. PULFREY, *Primary Examiner.*

NATHANIEL A. HUMPHRIES, *Assistant Examiner.*



TB1

SLSW NO CONTACT
PRINT SW NO CONTACT
-24V
-24V
-24V
DC GND

TB2

1 - -6V
2 } AC HOT
3 }
4 - CAM OPERATED READ SW.
5 } AC RET
6 }
7 - PRINT CYC. E MOTOR
8 - CLUTCH SOLENOID
9 - CODE WHEEL MOTOR
10 - RACE NO MOTOR

TB3

BRUSH PICK UP - CODE DRUM #1 (ITEM 6)
7 - 24V
8 - RL2
9 - TI15 & TI16

TB4

BRUSH PICK UP - CODE DRUM #2 (
1 - CODE DRUM 1 & 2 COM

TB5

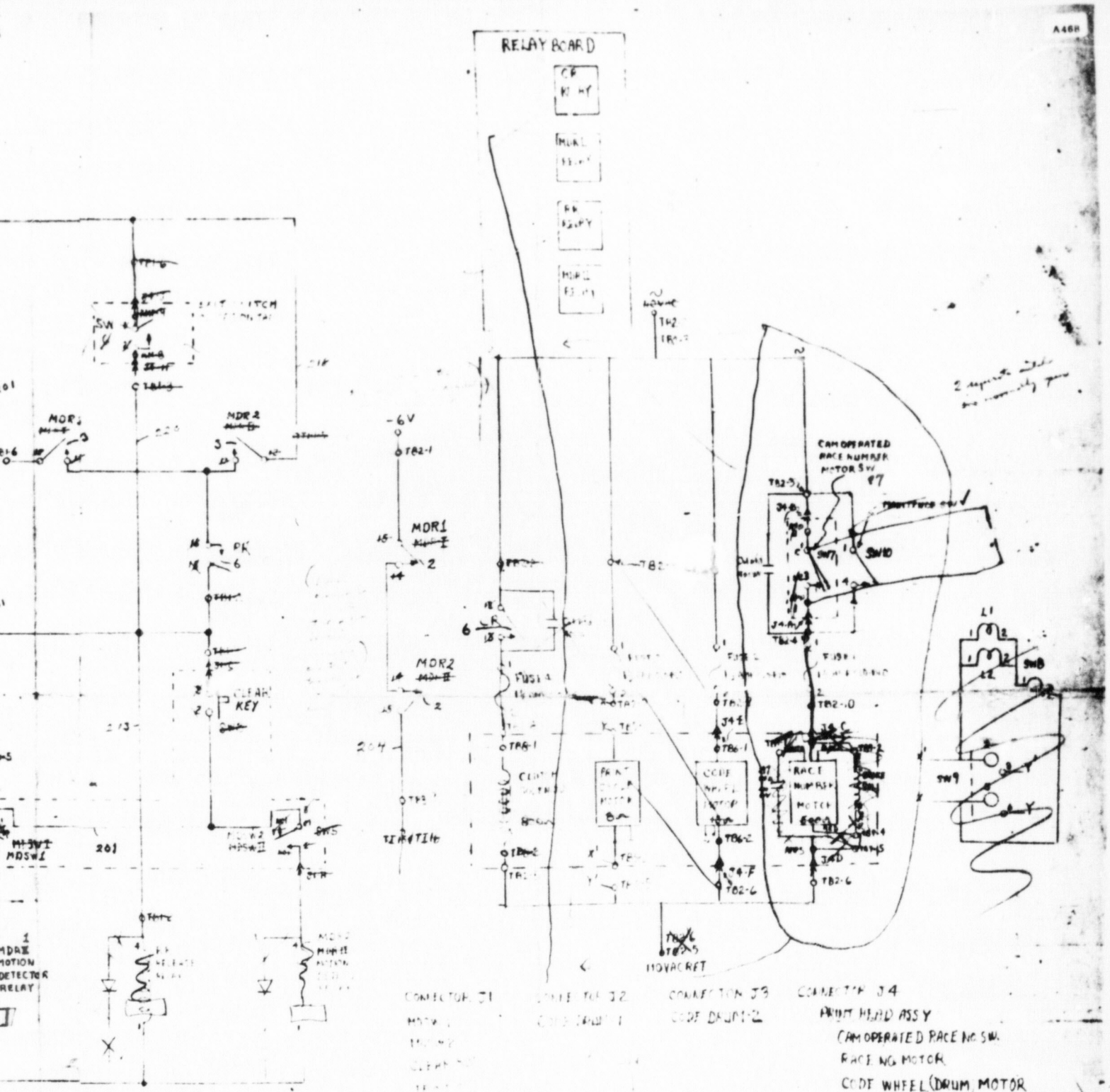
1 AC HOT } PRINT CYCLE
2 - AC RET }

TB6

1 - AC HOT } CODE WHEEL
2 - AC RET } MOTOR

TB7

1 - BRG
2 - 209



CONNECTOR J1 — CODE TO J2 — CONNECTOR J3 — CONNECTOR J4

PRINT HEAD ASSY

CAM OPERATED RACE NO SW

RACE NO. MOTOR

CODE WHEEL (DRUM MOTOR

EXIT SW

NOTES

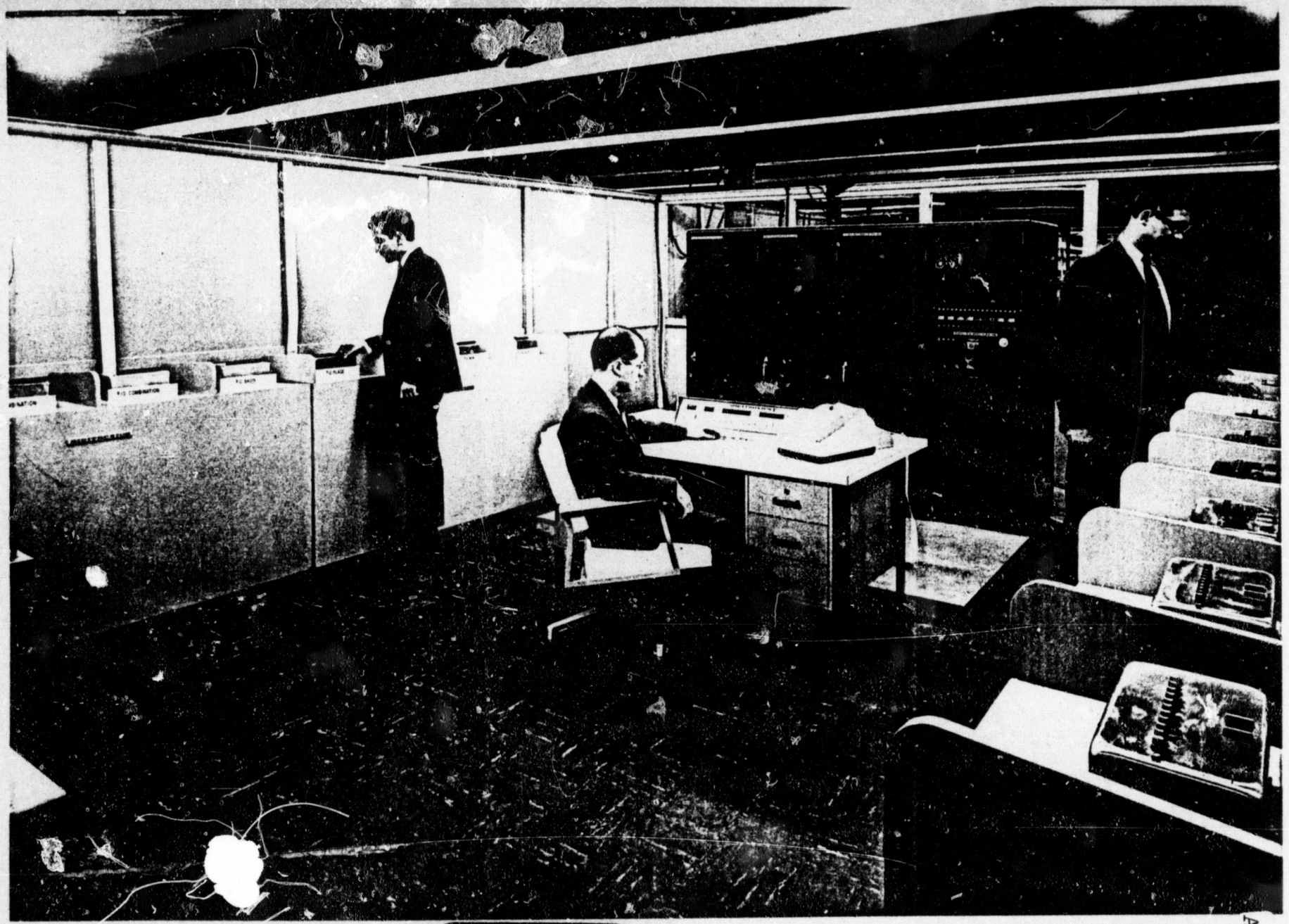
1. ALL ITEMS WITHIN [illegible] ARE PART OF DD-TIM
2. UNBOTTED) RELAY [illegible] ARE LOCATED ON RELAY BOARD
3. ALL DIODES ARE GE IN91

TB8
1-AC HOT } CLUTCH
2-AC RET } SOL.

PLAINTIFF'S EXHIBIT 100 67C 119

DIGITRONICS

SCHEMATIC DAISY BOARD MOTOR ISSUE MACHINE



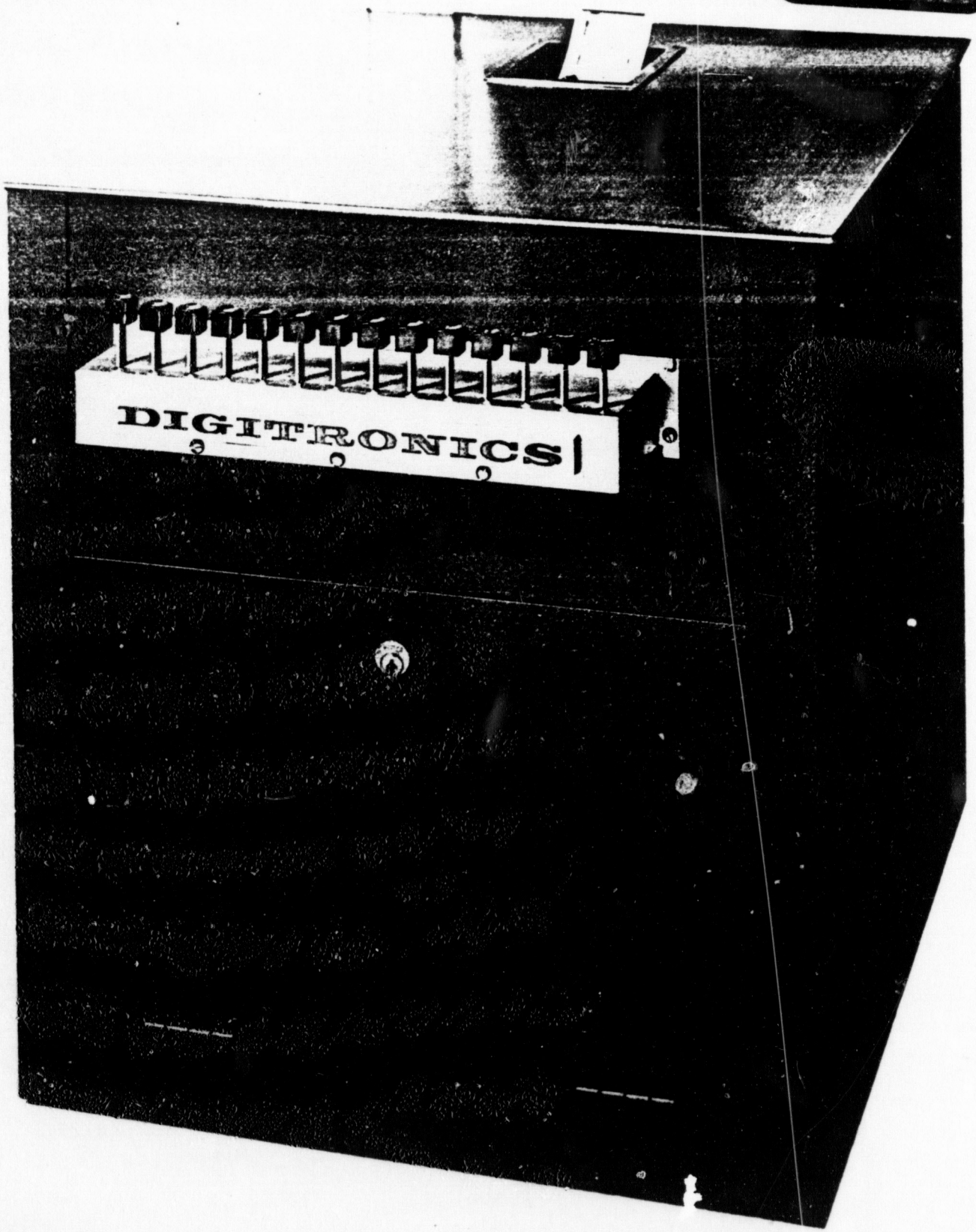
A469

DIGITRONICS
1
HORSE NO.
1:4
ODDS
000712
WIN POOL
00502
PLACE POOL
00442
SHOW POOL

A470

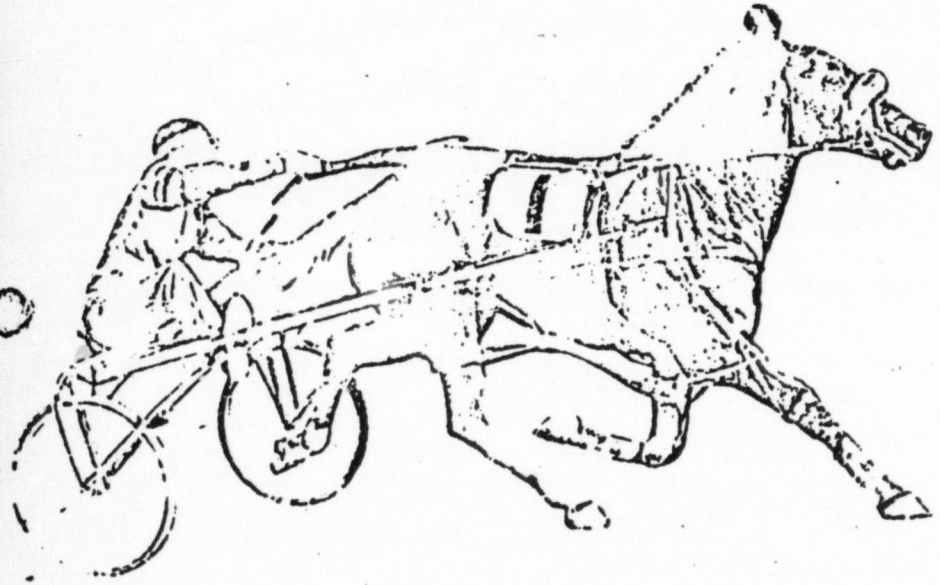
A471

A472



presents the world's first

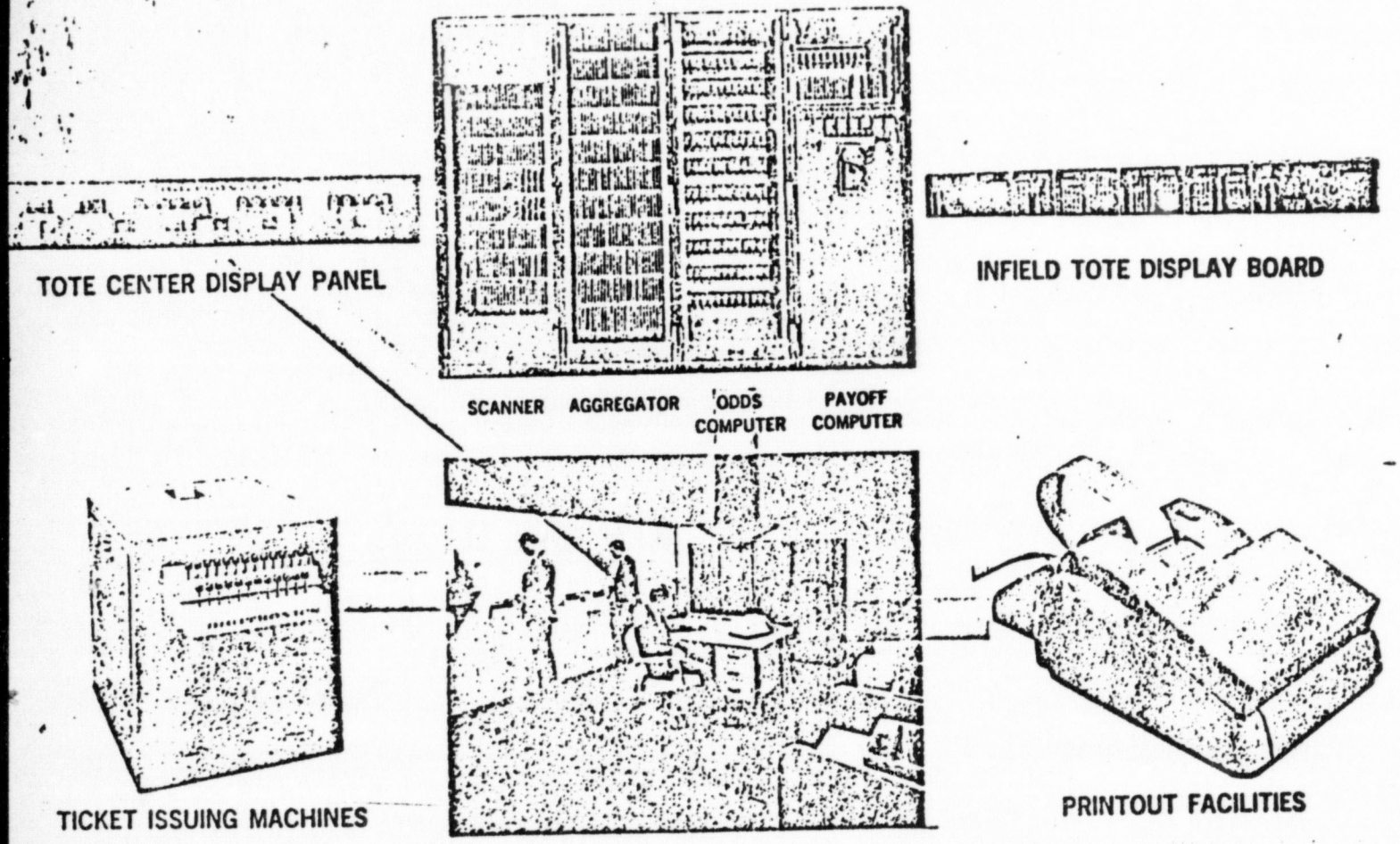
ALL-ELECTRONIC TOTALIZATOR



A473

A474

THIS ALL-ELECTRONIC PARI-MUTUEL SYSTEM CONSISTS OF:

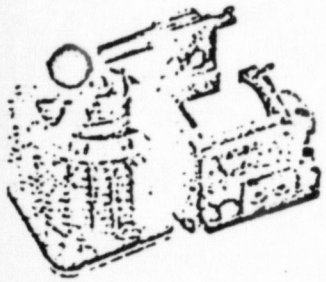


This All-Electronic Pari-Mutuel System consists of complete tote center, ticket issuing machines, infield tote display board, and other remote displ boards around the track. The tote center consists a scanner, aggregator, odds computer, payoff co puter, a tote center display panel, and printo facilities. The function of each of these elemen will be explained in detail at a later point.

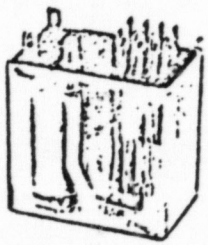
THIS SYSTEM IS CONSTRUCTED ENTIRELY OF ELECTRONIC DIGITAL EQUIPMENT

ELECTRONICS VS. ELECTRO-MECHANICAL

ELECTRO MECHANICAL — NUMEROUS MOVING PARTS



ELECTRO-MECHANICAL STEPPING SWITCH

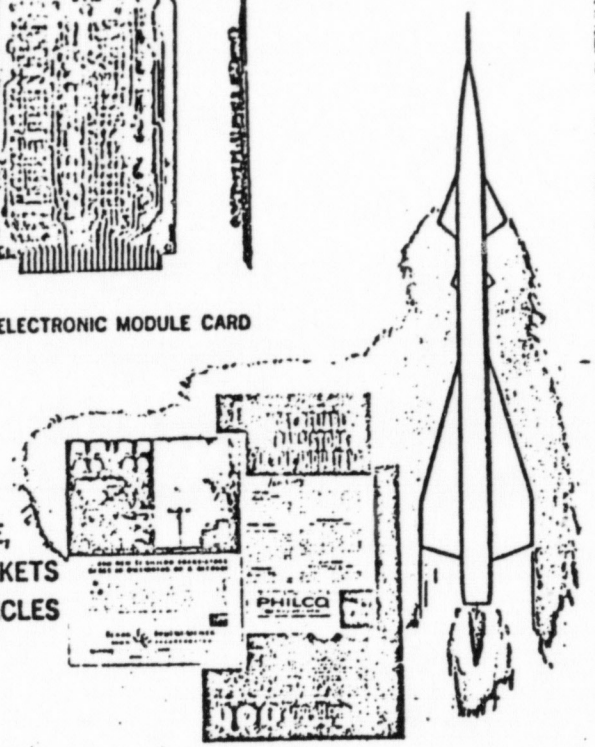


ELECTRO-MECHANICAL RELAY

ELECTRONICS — NO MOVING PARTS

FRONT SIDE

ELECTRONIC MODULE CARD



ALL-SOLID STATE, AS USED IN ROCKETS AND SPACE VEHICLES

Totalizators presently in use at race tracks throughout the world are based on electro-mechanical equipment. This type of equipment is large and bulky, and has a great number of moving parts, including stepping switches and relays. The moving parts constitute a constant source of trouble. They generate friction, wear out and have to be replaced, causing breakdowns and possible interruption of service. In the All-Electronic Totalizator, all totalizing and calculating is accomplished with pure, electronic digital solid-state equipment, with no moving parts. The elements are small and compact. They utilize electronic module cards, the same as those used in rockets, satellites, and space vehicles. They offer compactness, durability and dependability — virtually never wear out.

A476

THE ALL-ELECTRONIC TOTALIZATOR IS SUPERIOR TO ELECTRO-MECHANICAL EQUIPMENT

- MORE ACCURATE (no human calculations)
- GREATER SPEED
- MORE RELIABLE (no moving parts)
- MORE FLEXIBILITY
- LOWER MAINTENANCE COSTS (reflected in lower price)
- LESS EXPENSIVE
- OCCUPIES LESS SPACE (has greater mobility)

The Tote Board Lights Up an Error

There WAS something new under the lights at Roosevelt Raceway last night—an error in calculation — and the mistake cost the track $10,000.

The explosion took place moments after the third race when the odds popped on long-shot [illegible] Kelly Kimmer was flashed on the board as $34.70. Seconds later, it was changed to $31.20, a difference of $3.50 on every $2 ticket held by the bettors among the crowd of 19,913.

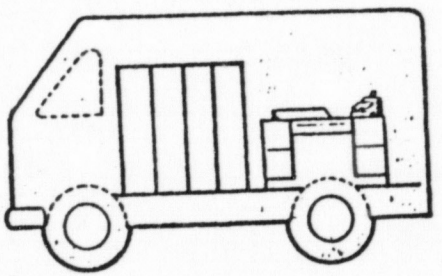
The judges announced the error had occurred in the calculating room. Because some payoffs on the bigger pays had already been made in the brief time it took to make the correction, the track had to pay off every ticket holder on the longer sum.

The total win pool on the short race was $168,339.

Asked what might happen to the clerk who messed up on his arithmetic, a track spokesman said, "Nothing. The man who checks on the party of the first part is equally at fault."

At Wrd. RR pony, recalled shot once before a 20-cent higher price had been flashed on the show price on the board, but the error was caught before anyone had been paid. CONFD.

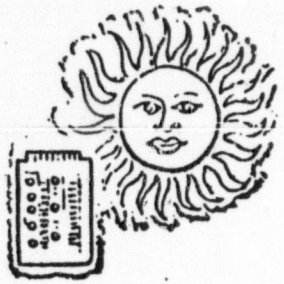
New York Post — May 25, 1961



The All-Electronic Totalizator has many features which are superior to the electro-mechanical equipment now in use.

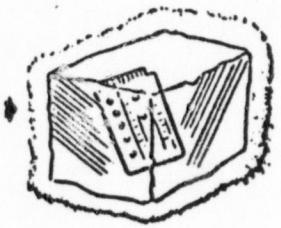
1. It is far more accurate because none of the calculations are done by humans. With an electro-mechanical system, the odds are computed by machines, but the payoff calculations are done by humans. Recently Roosevelt Raceway suffered a loss of more than $10,000 due to an error in arithmetic by one of the clerks. This couldn't happen with the All-Electronic Totalizator because all the calculations are done electronically by the computers.
2. It offers far greater speed. Electronics function much faster than electro-mechanical equipment. All transactions are reported instantly. All calculations are done instantly. As a result, daily-double windows now can be held open until the very last moment before a race starts.
3. It is far more reliable. There are no moving parts to break down.
4. It offers more flexibility. The denomination of windows can be changed from the tote center. Daily-double windows can be changed the same way. It also copes with late scratches.
5. It offers lower operating costs. Since all the elements are solid-state, and there are no moving parts, maintenance costs are lower.
6. It is less expensive. With the compactness of solid-state components, less equipment is required. There is no need for the hundreds of stepping switches and relays. The net result is lower cost.
7. It offers greater mobility. Since there is less equipment, it occupies less space and increases mobility. The system can be installed in a trailer and moved easily from track to track.

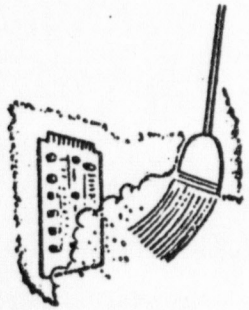
SUPERIOR ALSO BECAUSE IT IS LESS SENSITIVE TO:



HEAT

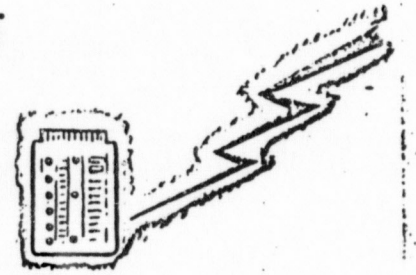
COLD

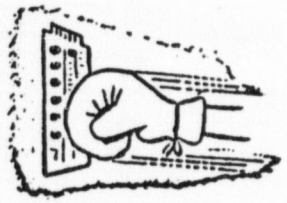




SAND and DIRT

ELECTRICAL DISTURBANCES



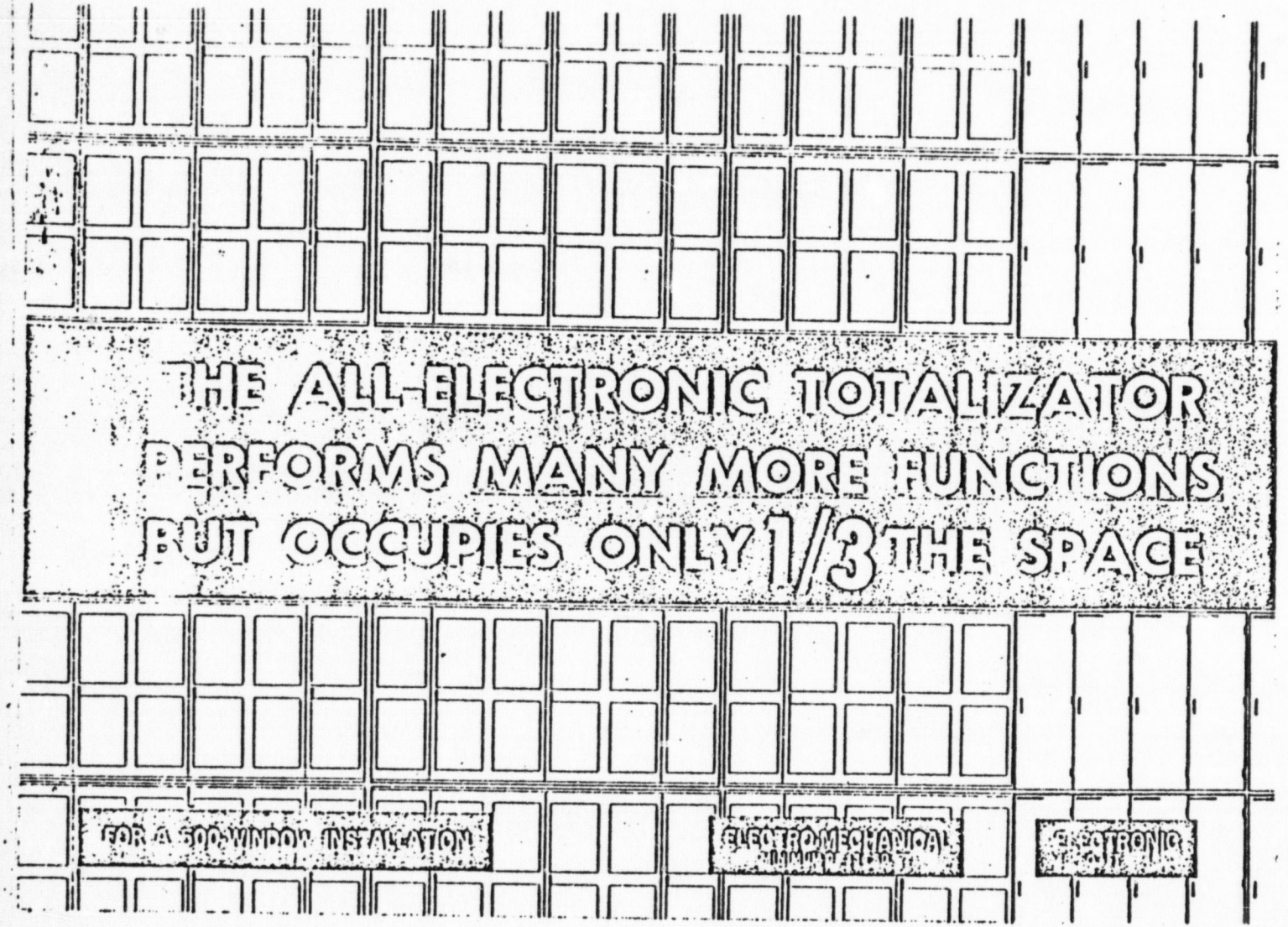


IMPACT (solid-state)

The All-Electronic Totalizator is superior to electro-mechanical equipment because it is less sensitive to the elements. Solid-state components are less sensitive to heat, cold, sand and dirt. There are no moving parts to overheat or freeze. There are no moving parts to malfunction when sand and dirt seep in. Solid-state components are less sensitive to electrical disturbances. They are less sensitive to movement and impact. Lack of sensitivity to all of these factors is one of the reasons solid-state components are used in rockets and satellites.

A477

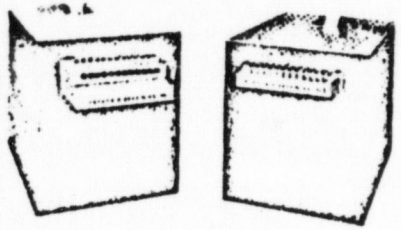
A478



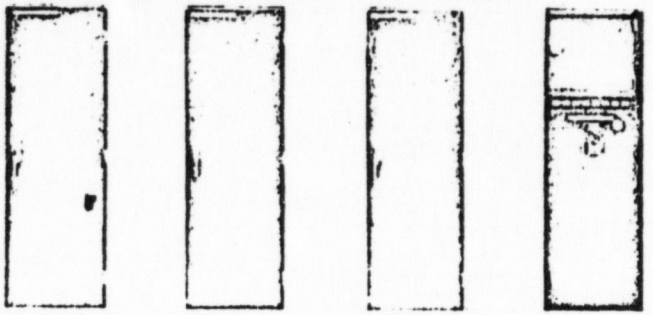
Although the All-Electronic Totalizator performs many more functions than the electro-mechanical system, it occupies only one-third the space. The use of solid-state electronic components, such as module cards, diodes, transistors and magnetic memory cores to replace large, bulky stepping switches and other electro-mechanical equipment, results in a considerably more compact system. For example, the electro-mechanical equipment needed for a 500-window track requires a minimum of 134 square feet of space. For the same installation, the All-Electronic Totalizator occupies only 48 square feet — two-thirds less space.

HERE IS WHAT THE ALL-ELECTRONIC TOTALIZATOR DOES:

REGULAR AND DAILY-DOUBLE WAGERS ARE PLACED AND TICKETS ISSUED



NUMBER OF HORSE AND DESIGNATED POOL ARE TRANSMITTED TO TOTE CENTER



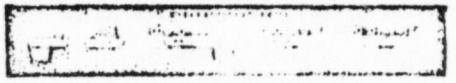
DATA IS ENTERED INTO MEMORY AND CHECKED FOR ACCURACY

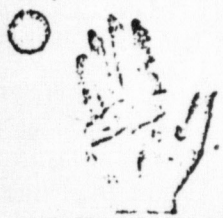
AGGREGATOR ACCUMULATES ALL TRANSACTIONS

COMPUTER TRANSLATES TRANSACTIONS INTO DOLLARS AND CALCULATES PROBABLE ODDS

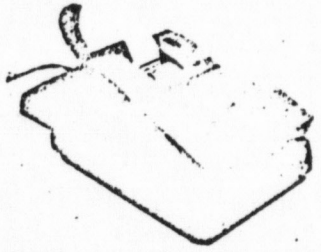
POSTS THE RESULTS ON MAIN DISPLAY BOARD, INCLUDING TOTALS WAGERED ON EACH HORSE FOR EACH POOL

TO REMOTE DISPLAY BOARDS AROUND TRACK





MAGNETIC MEMORY CORE — THE HEART OF THE SYSTEM



PRINTS OUT:

a) NUMBER OF TRANSACTIONS FOR EACH HORSE IN EACH CATEGORY OF WAGER

b) TOTALS WAGERED ON EACH HORSE FOR EACH CATEGORY

c) NUMBER OF WAGERS ON EACH HORSE AT EACH WINDOW

AFTER EACH RACE:

- COMPUTES THE PAYOFF
- COMPUTES POSSIBLE DAILY DOUBLE PAYOFFS
- AND FINAL DAILY DOUBLE PAYOFF
- CALCULATES AMOUNT DUE TO TRACK AND STATE
- ALLOWS FOR "BREAKAGE"

Although the function of each piece of equipment will be depicted and explained at a later point, here is the flow of data and activity provided by the All-Electronic Totalizator. As regular and daily double wagers are made at the windows, tickets are issued by the ticket issuing machines. Before a ticket is issued, the transaction is automatically transmitted to the tote center. It is only when the wager has been registered that the ticket emits from the machine. The data consists of the amount of the wager, the number of the horse, and the designated pool. In the tote center, the data is entered into the fully electronic memory and is checked for accuracy.

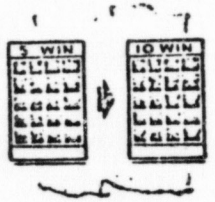
It then goes into the aggregator, which accumulates all transactions. From there it goes into the odds computer. The computer translates all the transactions into dollars and calculates the probable odds. The odds are then transmitted to and displayed on the tote center display panel, the infield tote display board, and the remote display boards around the track. For each race there is a continuous display of the total of the win, place and show pools, and of the individual horse total for each pool. The display cycles every 70 seconds; it takes about one second to complete each updating. On the infield display board, odds and totals for all horses, as well as the totals for all pools, are on display simultaneously and continuously. Following the completion of the first race, possible payoffs for the daily-double are displayed.

After windows are closed, the information is then printed out on paper. This includes the number of transactions for each horse in each category of wager, the totals wagered on each horse for each category, and the number of wagers on each horse at each window.

At the conclusion of each race, the payoff computer calculates the payoff. It computes the possible daily-double payoffs and the final daily-double payoff. It calculates the amount due to the track and the state, and allows for breakage. All this, from the time a wager is placed until all calculations are completed at the end of a race, is done electronically — and the heart of the entire system is the tiny magnetic memory core. It is this tiny element which permits the computers and other equipment to function so rapidly, accurately and dependably. It is minute in size, but gigantic in its accomplishments.

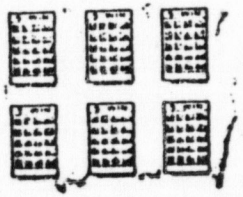
THE TOTE CENTER ALSO:

COPES WITH SCRATCHES, DEAD HEATS AND OTHER VARIABLES



REDESIGNATES WINDOWS (from $5 to $10, etc.)

PERMITS DAILY-DOUBLE WAGERS TO THE LAST MINUTE



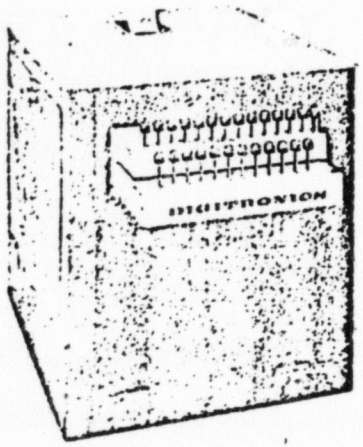
HANDLES EIGHT 1,000-WINDOW TRACKS AS EASILY AS ONE 10-WINDOW TRACK

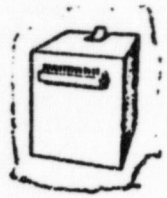
Although we have followed the flow of data and activity provided by the All-Electronic Totalizator, the tote center provides additional facilities worthy of mention. From the tote center, windows can be redesignated — a $5 window can be changed to a $10 window, a $2 window to a $5 window, etc. Windows can be made inoperative from the tote center. Because of the speed in handling transactions, the tote center permits daily-double windows to remain open until the very last second before a race starts.

The tote center also copes with scratches, dead heats and other variables. In the event a horse is scratched, a control in the tote center instructs the ticket issuing machines not to accept a wager on the scratched horse. The operation of the scratch button with a horse involved will remove the total pool involving that horse on the probable odds computation or the payoff computation. In the daily-double operation of the scratch, controls automatically set up the consolation pool, if desired. This pool consists of all money wagered on the scratched horse in the second race, in combination with each winning horse in the first race.

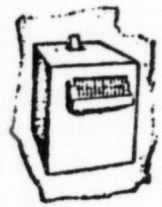
The tote center is designed to handle all size tracks, from the smallest to the largest. It can handle eight 1000-window tracks as easily as one 10-window track, without any loss in speed.

HERE IS WHAT THE TICKET ISSUING MACHINES DO:





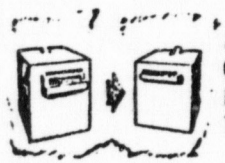
REPORT ALL WAGERS AND ISSUE ALL TICKETS



REPORT AND ISSUE DAILY-DOUBLE WAGERS AS EASILY AS REGULAR WAGERS

TAKE SLIGHTLY MORE THAN ½ SECOND TO ISSUE TICKET AND REPORT TO TOTE CENTER REGARDLESS OF HEAVY WAGERING TRAFFIC

KEEP RECORDS FOR EACH WINDOW FOR EACH RACE — FOR ALL CONTINGENCIES



A DAILY-DOUBLE OR QUINIELLA MACHINE MAY BE CONVERTED TO REGULAR WAGERING

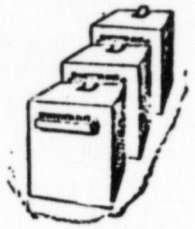
The ticket issuing machines are designed to function with the All-Electronic Totalizator. Basically, they report all wagers and issue all tickets. They report and issue tickets for daily-double wagers as easily as for regular wagers. The machines allow for regular wagers, the sale of tickets for win, place and show positions, in any size denominations, including $2, $5, $10, $50 and $100, plus the combinations of $4, $6, and $10. For daily-double wagers, the machines allow for the sale of daily-double tickets for $2, $10 wagers, etc.

The machines are fast: it takes each machine slightly more than one-half second to report the details of the transaction to the tote center and issue a ticket regardless of how many wages are being made. All machines, both regular and daily-double, are scanned four times every second. This applies from the smallest installation to installations of up to 1000 windows. The machines also may be converted from daily-double or quiniella operations to win, place or show.

In addition to reporting transactions to the tote center, a record is kept of all transactions for each race, for each ticket issuing machine for each window. For the regular machines, a counter is used to record the total number of wagers passing through the machine for each rate. For daily-double machines, a perforated paper tape is punched to record each transaction. If something were to destroy the entire tote center, wagering could continue and records of all transactions could be obtained to permit hand calculation of the payoff.

A482

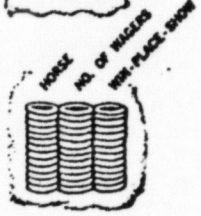
ERE IS WHAT THE GGREGATOR DOES:



ACCEPTS ALL DATA FROM TICKET ISSUING MACHINES

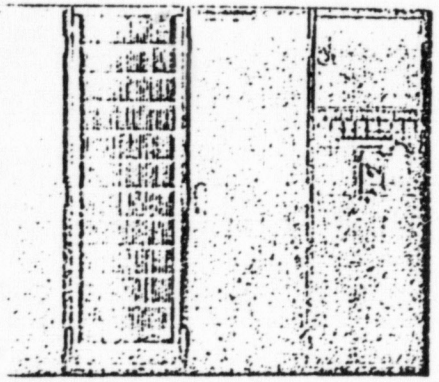
REFUSES TO ISSUE TICKETS ON UNACCEPTABLE WAGERS (such as scratches, etc.)

STORES ALL DATA IN MAGNETIC MEMORY CORES



KEEPS ALL DATA BY HORSE, DENOMINATION OF WAGER, POOL etc.

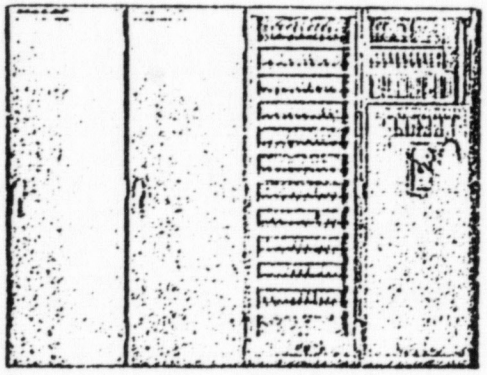
DUPLICATES RECORDS KEPT FOR EACH WINDOW (OPTIONAL)

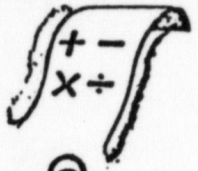


The basic function of the aggregator is to accept all the details of all transactions from the ticket issuing machines. It accumulates the number of wagers for each denomination, for each horse, and (in the case of regular wagers) for each pool. This is subject to a four-way check, since it is accomplished by two computing sections, each of which checks against itself and against the other. It accumulates the number of wagers for each horse at each selling machine. This is subject to a two-way check, since it does each operation twice and thus checks against itself. It will reject unacceptable wagers. For example, if a wager is placed on a horse which has been scratched, it will not allow the ticket issuing machine to issue a ticket.

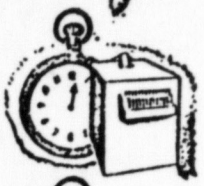
As the aggregator accepts data from the ticket issuing machines, it stores it in the magnetic memory cores. In maintaining all this data, it duplicates the records kept at each window by the ticket issuing machines (optional).

ERE IS WHAT THE ODDS COMPUTER AND PAYOFF COMPUTER DO:

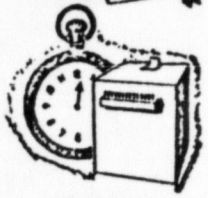




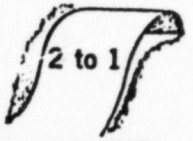
CALCULATE ALL TOTALS



CALCULATE DAILY-DOUBLES INSTANTLY

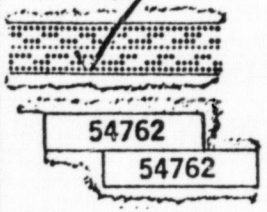


CALCULATE REGULAR RACES INSTANTLY



CALCULATE PROBABLE ODDS INSTANTLY

CALCULATE PAYOFF TO NICKEL OR DIME



TWO COMPUTERS CHECK EVERY STEP AND COMPARE ALL FIGURES AND TOTALS

The basic function of the computers is to do all the required calculations, to do them quickly, and to do them accurately. As the computation is done, the wagers are translated into dollars. The computers calculate all the totals for daily-double wagers instantly. They calculate all the totals for regular race wagers instantly. They calculate probable odds instantly. A probable odds computation is performed once every 70 seconds. At the conclusion of each race, the computers calculate the public payoff adjusted to the nickel or dime. The computation of the payoff is made available within 15 seconds after the order of finish is punched into the central control units; for the daily-double, the computation of probable payoffs, after completion of the first race, is made available in about 10 seconds. Upon completion of the second race of the daily-double, the daily-double payoff, rounded down to the nearest dime, is made available.

To insure accuracy in the transmission of the data from the ticket issuing machines to the tote center, a special checking code is used. To insure the accuracy of all calculations, two computers are used, to check every step in each calculation. The calculations are done by both computers, and then all figures and totals are compared to make sure they are accurate. Each computer can do the computation twice, to further reduce the possibility of error. There are also internal checking features in each computer.

A483

HERE IS WHAT THE

A484

REGULAR WAGERING PRINTOUT OF PAYOFF COMPUTATION

WN			WIN POOL COMPUTATION
SC		.00	LATE SCRATCHES
T		489,874.00	TOTAL WIN POOL
CM		73,481.10	COMMISSION
NP		416,392.90	NET POOL
PY		415,990.00	TOTAL PAYOFF ON WINNING TICKETS
◯		402.90	BREAKAGE
		.00	PROOF
PY	6—	8.50	(PAYOFF FOR WINNING HORSE
		21.25	FOR THE $2, $5, $10, $50 AND
		42.50	$100 WAGERS, INCLUDING
		212.50	COMBINATIONS)
		425.00	
			(IN THE EVENT OF A DEAD HEAT, THIS PRINTOUT IS REPEATED FOR THE SECOND HORSE INVOLVED.)
PL			PLACE POOL COMPUTATION
SC		.00	LATE SCRATCHES
T		397,565.00	TOTAL PLACE POOL
CM		59,634.75	COMMISSION
NP		337,930.25	NET POOL
PY		337,985.50	TOTAL PAYOFF ON PLACE TICKETS
BR	—	55.25	BREAKAGE—NOTE THE MINUS POOL
		.00	PROOF
◯	6—	4.40	(PAYOFF FOR WINNING HORSE
		11.00	NUMBER 6 FOR THE $2, $5, $10,
		22.00	$50 AND $100 WAGERS,
		110.00	INCLUDING COMBINATIONS.)
		220.00	
PY	3—	3.80	(PAYOFF FOR PLACING HORSE
		9.50	NUMBER 3 FOR THE $2, $5, $10, $50 AND $100 WAGERS)
			(IN THE EVENT OF A DEAD HEAT, THIS PRINTOUT IS REPEATED FOR THE HORSES INVOLVED)

THE SHOW POOL COMPUTATION PRINTOUT IS SIMILAR TO THE PLACE PRINTOUT EXCEPT THAT THREE HORSE PAYOFFS ARE SHOWN

C		4.00	COMBINATION PAYOFF COMPUTATION
PY	6—	12.90	PAYOFF FOR $4 COMB. ON WINNING HORSE
	3—	3.80	PAYOFF FOR $4 COMB. ON PLACE HORSE
C		6.00	
PY	6—	14.80	PAYOFF FOR $6 COMB. ON WINNING HORSE
	3—	8.20	PAYOFF FOR $6 COMB. ON PLACE HORSE
	5—	3.60	PAYOFF FOR $6 COMB. ON SHOW HORSE
C		10.00	
PY	6—	32.25	PAYOFF FOR $10 COMB. ON WINNING HORSE
	3—	9.50	PAYOFF FOR $10 COMB. ON PLACE HORSE

DAILY-DOUBLE PRINTOUT: PROBABLE PAYOFF FOR EACH SECOND RACE HORSE WITH WINNING HORSE IN THE FIRST RACE (AVAILABLE IMMEDIATELY AFTER THE FIRST RACE)

DD	6—		(DAILY-DOUBLE HORSE #6 HAS WON THE FIRST RACE)
	1—	45.20	PROBABLE PAYOFFS FOR HORSE #6 IN THE FIRST RACE WITH EACH OF THE HORSES IN THE SECOND RACE
	2—	57.90	
	3—	88.00	
	4—	23.10	
	5—	56.80	
	6—	123.30	
	7—	81.70	
	8—	55.00	

REGULAR WAGERING DENOMINATIONAL PRINTOUT OF THE PARI-MUTUEL TOTALS

WN		2.00
	1—	15,694.00
	2—	9,776.00
	3—	8,402.00
	4—	10,866.00
	5—	7,280.00
	6—	2,002.00
	7—	5,874.00
	8—	8,994.00
	9—	3,500.00
	10—	5,246.00
T		77,634.00
WN		5.00
	1—	3,455.00
	2—	10,670.00
	.....	.....
	10—	9,895.00
T		58,240.00
WN		10.00
	1—	7,890.00
	2—	5,760.00
	.....	.....
	10—	8,390.00
T		45,200.00
WN		50.00
	1—	4,050.00
	2—	7,000.00
	.....	.....
	10—	3,650.00
T		33,250.00
WN		100.00
	1—	5,400.00
	2—	4,800.00
	.....	.....
	10—	2,700.00
T		25,800.00

WN	1—	36,489.00
WN	2—	38,006.00
	.....	.....
WN	10—	29,791.00
T		460,842.00

C		4.00
	1—	2,436.00
	2—	2,012.00
	.....	.....
	10—	1,968.00
T		18,844.00
C		6.00
	1—	4,896.00
	2—	3,726.00
	.....	.....
	10—	2,286.00
T		24,258.00
C		10.00
	1—	4,570.00
	2—	3,530.00
	.....	.....
	10—	7,250.00
T		22,048.00

FOR PLACE, THE ABOVE IS REPEATED WITH "PL" INSTEAD OF "WN". FOR SHOW, THE ABOVE IS REPEATED WITH "SH" INSTEAD OF "WN". THE COLUMN ABOVE WHICH SHOW THE PRINTOUT TOTALS FOR COMBINATION WAGERING, FOLLOW THE SHOW PRINTOUT.

RINTOUT WILL INCLUDE:

WINDOW # / HORSE

• REGULAR WAGERING PRINTOUT OF NUMBER OF WAGERS ON EACH HORSE AT EACH WINDOW

WINDOW #	1	2	3	4	5	6	7	8	9	10	TOTAL
001	246	175	242	163	284	272	169	172	161	191	2,075
.	.	.	.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	.	.	
135	379	48	326	176	135	221	26	216	117	211	1,855
136	127	271	19	200	305	96	101	161	171	121	1,572
.	.	.	.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	.	.	
350	167	215	115	45	54	169	141	372	300	212	1,790

WINDOW #

• DAILY DOUBLE PRINTOUT OF NUMBER OF WAGERS ON EACH COMBINATION AT EACH WINDOW

WINDOW #	FIRST RACE HORSE	SECOND RACE HORSES 1	2	3	4	5	6	7	8	TOTALS
C01	1	271	372	127	261	139	77	277	119	1,643
	2	165	172	271	265	391	222	111	121	1,718
	3	256	217	179	115	166	199	152	155	1,439
	.	.	.	.	.	.	.	.	.	.
	8	.	.	.	.	.	.	.	.	.
TOTALS		692	761	577	641	696	498	540	395	4,800
C02	1	143	172	171	115	151	142	143	174	1,211
	2	165	177	172	151	232	214	391	372	1,874
	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
TOTALS		309	349	343	266	383	356	534	546	3,086
120	1	167	324	243	311	333	214	216	261	2,069
	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
	8	176	234	167	131	313	124	162	114	1,421
TOTALS		343	558	410	442	646	338	378	375	3,490
SUMMARY		3,344	1,668	1,330	1,349	1,725	1,192	1,452	1,316	11,376

DAILY-DOUBLE PARI-MUTUEL TOTALS PRINTOUT—FIRST RACE WINNER WITH $2 AND $10 WAGERS FOR SECOND RACE HORSES

DD		2.00	DAILY-DOUBLE $2 COMPUTATION
T		357,866.00	TOTAL DAILY-DOUBLE $2 WAGERS
WN	6—		HORSE #6 IS FIRST RACE WINNER
	1—	12,548.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 1 WITH #6
	2—	14,944.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 2 WITH #6
	3—	9,866.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 3 WITH #6
	4—	11,832.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 4 WITH #6
	5—	8,546.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 5 WITH #6
	6—	17,256.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 6 WITH #6
	7—	10,570.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 7 WITH #6
	8—	6,582.00	TOTAL $2 WAGERS ON SECOND RACE HORSE 8 WITH #6
T		92,144.00	TOTAL $2 WAGERS ON ALL SECOND RACE HORSES AND #6
DD		10.00	DAILY-DOUBLE $10 COMPUTATION
T		369,400.00	TOTAL DAILY-DOUBLE $10 WAGERS
	1—	13,620.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 1 WITH #6
	2—	9,220.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 2 WITH #6
	3—	8,540.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 3 WITH #6
	4—	15,240.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 4 WITH #6
	5—	13,200.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 5 WITH #6
	6—	10,870.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 6 WITH #6
	7—	8,570.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 7 WITH #6
	8—	9,560.00	TOTAL $10 WAGERS ON SECOND RACE HORSE 8 WITH #6
T		88,820.00	TOTAL $10 WAGERS ON ALL SECOND RACE HORSES AND #6
DD		727,266.00	TOTAL DAILY-DOUBLE POOL

• DAILY DOUBLE PAYOFF CALCULATION PRINTOUT

DD			DAILY DOUBLE COMPUTATION
SC		.00	CONSOLATION POOL
T		727,266.00	TOTAL DAILY DOUBLE POOL
CM		109,089.90	COMMISSION
NP		618,176.10	DAILY DOUBLE NET POOL
PY		617,586.40	TOTAL PAYOFF OF WINNING TICKETS
BR		589.70	BREAKAGE
		.00	PROOF
PY	6-5	2.00	PAYOFF FOR $2 TICKETS
		56.80	
PY	6-5	10.00	PAYOFF FOR $10 TICKETS
		284.00	

For immediate use as well as for permanent records, the All-Electronic Totalizator provides the means whereby all transactions are recorded on paper, by means of a high-speed printer, which functions at a rate of 900 lines per minute. This is called the "printout". These records include the number of transactions for each horse at each ticket issuing machine (or window). For regular wagering, the printout of the number of regular wagers made on each horse, at each window, is done at the rate of 15 windows per second. For daily-double wagering, the rate of 0.6 seconds per window for an 8-horse field, one second for a 15-horse field.

For a track with less than 400 active windows, the total printout is completed for regular wagers in less than 40 seconds after wagering has ended and windows closed. The equipment also is capable of providing similar printout of the number of wagers placed at each daily-double window. For regular wagers, the printout will accommodate a total of fifteen 3-digit transaction amounts for each window. This allows up to 999 wagers to be made on each horse at each window, with means to prevent the seller from recording a 1,000th wager on a given horse. The daily double printout will accommodate sixty-four 3-digit printouts for each window, to allow for an 8-horse daily-double operation, or 225 for a 15-horse operation.

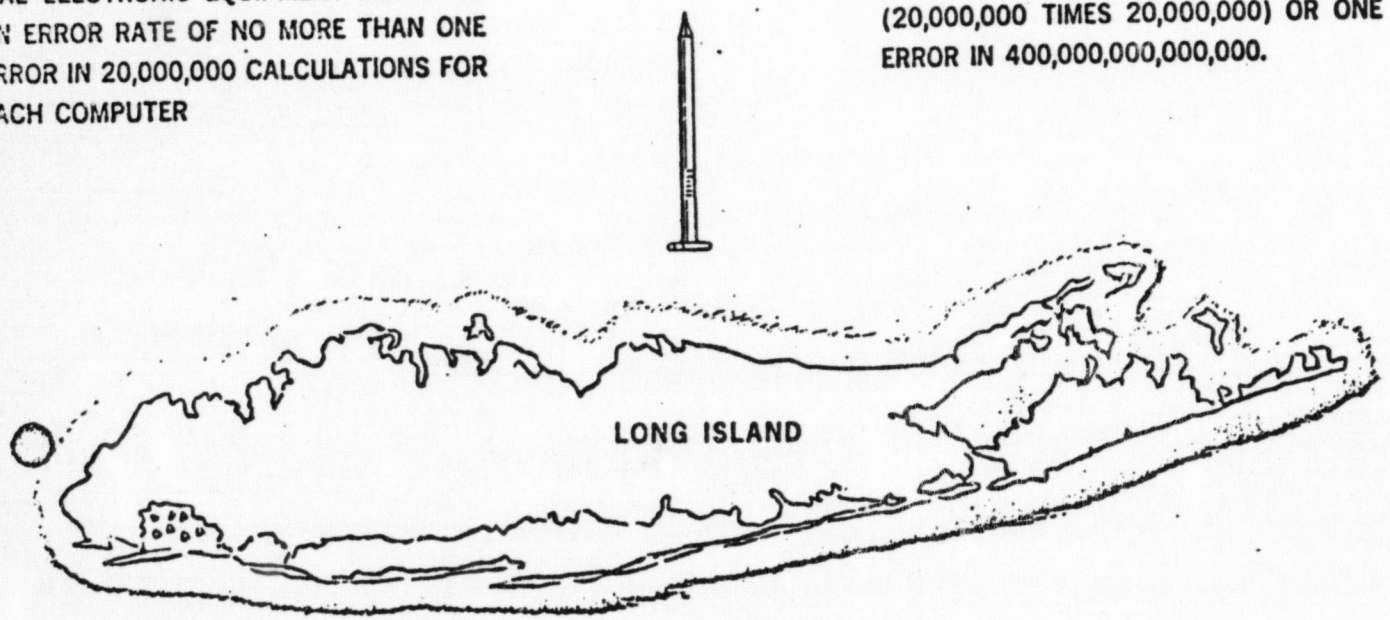
The chart at the left illustrates what the printout will include. Complete payoff calculations will be printed out, regardless of the number of dead heats in any position or the number of horses in the field.

A486

WE ESTIMATE LESS THAN 1 ERROR IN 400,000,000,000,000 CALCULATIONS (400 TRILLION)

OUR EXPERIENCE WITH SOLID-STATE DIGITAL ELECTRONIC EQUIPMENT INDICATES AN ERROR RATE OF NO MORE THAN ONE ERROR IN 20,000,000 CALCULATIONS FOR EACH COMPUTER

SINCE TWO COMPUTERS ARE USED, THE ERROR RATE IS THE PRODUCT OF BOTH (20,000,000 TIMES 20,000,000) OR ONE ERROR IN 400,000,000,000,000.



The experience we have had with solid-state digital electronic equipment indicates that we can expect no more than one error in 20,000,000 calculations for each computer. Since two computers are used, the error rate is the product of both. 20,000,000 multiplied by 20,000,000 results in an estimate of less than one error in 400,000,000,000,000 (400 trillion) calculations. To illustrate these figures graphically, take an area like Long Island, which consists of approximately 1,500 square miles. If one nail were sticking up somewhere in this 1,500 square mile area, and a car were to be driven over every inch of the entire area, the possibility of getting that nail into one of the tires — is as remote as getting one error with the All-Electronic Totalizator.

This, then, is the All-Electronic Totalizator. It offers far more advantages than any other equipment in use today . . . too many to enumerate in this brochure. The system can be modified to include fields of up to 30 horses. It can include such features as Quiniella, Quiniella Exacta, and Tiercé wagering. Advance wagering can be included. The design of the system is so flexible in capacity, that the same basic system can be efficiently and economically expanded to include more ticket issuing machines and more display boards. In other words, the system can be adapted to meet your particular requirements.

The All-Electronic Totalizator, marketed by Westbury Electronic Corp., was created by the Digitronics Corporation, an organization which has established an enviable reputation in the electronics field, particularly with regard to solid-state (all-transistorized) data processing equipment.

The first commercial installation of a solid-state converter (for conversion between magnetic tape and paper tape) was made by Digitronics for the largest stock brokerage firm in the country — Merrill Lynch, Pierce, Fenner & Smith. Digitronics converters have been created for other world-renowned organizations, including Aluminum Co. of America, Bache & Co., Canadian Pacific Railway Co., Tokyo Electric Power Co., Radio Corporation of America, Spiegels, the U. S. Strategic Air Command and others.

Digitronics also created the Dial-o-verter System, for the high-speed transmission of data, over regular telephone lines, to and from any number of widely scattered points. Dial-o-verter Systems are functioning throughout the country for Lever Brothers, Kellogg's, Mohasco Industries, Canadian Pacific Railway Co., the Applied Physics Laboratory of Johns Hopkins University, the U. S. Veterans Administration, the Social Security Administration, and many others.

Now Digitronics has created the world's first All-Electronic Totalizator. A prototype has been produced, successfully demonstrated, and the first complete system is in production. For further information about the All-Electronic Totalizator, address communications to:

WESTBURY ELECTRONIC CORP.
c/o ROOSEVELT RACEWAY
Westbury, Long Island, N. Y. • Phone: PI 6-6000

A487

WESTBURY ELECTRONIC CORP.

488

PLAINTIFF'S EXHIBIT

(26)
(32)

A489

ROOSEVELT RACEWAY, INC.

ANNUAL MEETING OF STOCKHOLDERS

WESTBURY, N.Y.

APRIL 17, 1962

---oOo---

ALVIN L. WEIL, President

GEORGE MORTON LEVY, Chairman, Executive Committee

J. ALFRED VALENTINE, Chairman, Board of Directors

AMANDA F. DOOLEY, Secretary

---oOo---

CHARLES F. KOERNER, C. S. R.
NEW COUNTY COURT
MINEOLA, N. Y.

D7-1-1

A490

In addition -- and this, Mr. Lesser, may answer your question -- in addition, this year we show you on the right side the result of what we were talking about last year, about our interest in an electronic corporation. If I may, for several years Roosevelt Raceway, in conjunction with the Digitronics Corporation, which is located in Albertson, and which, over these periods of years, has turned out to be one of the foremost small electronics companies in the world -- I mean, this is not a company that builds transistors or some small part that's used by other people -- this is a company that builds systems, this is a company that does the kind of things that you read about, and that you will be reading about. This is a company which has with it some of the best electronic brains in the country. And, really, our association with them has been most pleasant, most profitable.

I believe that we have developed a totalizator machine that not only will fulfill its original function here but also will find great value and use all over the United States and else-

where in the world. This totalizator was originally designed to be built for use at Roosevelt Raceway to replace the totalizator that we use now, which we rent, and for which we pay around $600,000 a year in rental -- this is a percentage on our mutuel handle.

We felt for a long time that we could do much better, we could save a lot of money, if we owned our own equipment. And we probably could also run a more economical operation by reason of utilizing more modern methods in the use of totalizator equipment.

Actually, the totalizator equipment which we now have here, and which is used all over the United States, is not electronic, it is electromechanical. It requires the use of many, many switches and much gears which can go out of order; it does not compute, it doesn't do automatically the things that we now, in this world, we get to recognize can be done by electronic machinery.

Therefore, we were interested in pursuing this matter with the Digitronics Corporation. For a while we were going to go into partnership with

Yonkers Raceway in the development of this totalizator. But we were unable to come to agreement with them. As a result of that, the Digitronics Corporation, just before our last meeting, took a half interest in the corporation which we formed together, known as Westbury Electronics Corporation.

Now, Westbury Electronics Corporation has the exclusive rights to the installation, sale or lease of the totalizator equipment which is being developed for it by Digitronics Corporation. And we have here diagrams which are part of the sales manual that is put out by the Westbury Electronics, which illustrate the method of operation of this equipment.

Now, I am not going to go into the technicals of it. I don't think that I could, I don't understand it fully myself, or too well. Nevertheless, I would like to point out to you this: That one of the problems with existing totalizator equipment is that, of course, there are moving parts. It operates by means of switches and relays, which become worn, and which have to be re-

placed, and which can go out of action at the most inopportune moment, and require constant surveillance.

This installation is of solid state electronics. It means that there are no movable parts. But by the use of transistors and diodes, and other new inventions which are small, which are lightweight, and all that, we are able to accomplish those things which require heavier equipment.

I believe we have one card which shows that this equipment, the equipment to run Roosevelt Raceway, could be put in a space one-third as large as the equipment that now runs Roosevelt Raceway.

Well, just imagine what this would be in the idea of being capable of portability. This equipment has to be moved out of our race track to Yonkers Raceway, or out of Belmont Park to Aqueduct, and from Aqueduct to Saratoga, in order to be used by many. Here, it would require one-third as much equipment to move. It might be stored compactly. As a matter of fact, we made

presentations for this, where the entire equipment is stored in a truck, and it can be carried from track to track without having to be dismantled, or without having to be moved at all.

So there is a great advantage in the totalizator equipment in which we are working, insofar as its lightness is concerned, its compactness, how easily it is transported.

In addition to this, the equipment that we have will do away with the necessity of people having to figure the prices. The computers which are built into this machine are able to compute the prices on the daily double, the prices on win, place and show, if necessary, the prices on quinella, instantaneously, just as soon as the results are known.

Now, time, of course, we know, is a very valuable thing in a race track. In a minute that this takes to figure the prices at Roosevelt Raceway a lot of business could be done; or, we could get the people out here nine minutes earlier at night. And that's quite valuable when you consider that the people have to go to work after

being here in the evening.

So when I talk about saving a minute, I am talking about saving a very valuable commodity in our business. Because we are constantly attempting ways where we can make our program more compact, and where we can utilize every possible moment for the conduct of our business and the placing of our bets.

This equipment, by virtue of the fact that it computes instantaneously, not only will save the manpower that is necessary now to calculate what the prices are but also will save time, which is a very valuable commodity in our industry.

Beyond this, we find that this equipment is not susceptible to many of the things that plagued other equipment. It is not susceptible to cold, or to heat, or to dirt. We have actually demonstrated portions of this equipment, which are the important heart of it. We sat with people that have been interested in seeing what we had, and we placed one of these innocent looking cards, which are the center of the system, in an ash tray,

and we made them put their ashes on it. They didn't realize what they were doing. Then, when the proper time for demonstration came around, they took it out of the ash tray, shook off the ashes, put it into the machine, and it worked. This illustrates how free this equipment is from those things which produce damage to existing equipment.

There was a race track which was attempted to be established in Las Vegas a few years ago. As a matter of fact, I read in the paper today that some people want to reactivate it. By the time they put the equipment up, the shifting sands that were blowing through the desert put the equipment out of business, and they were unable to operate. The tremendous investment was lost because of the fact that their equipment could not operate in the sand and the dust and the dirt that existed in that climate. Here, of course, with this type of equipment it is meaningless.

We have put water on this equipment. If it rained on it, it couldn't stop it -- the rain water being pure. It's not sensitive to heat. It

BEST COPY AVAILABLE

can be out in baking sunlight and it would not have any effect on it. All of these things have great value insofar as the reliability of this equipment is concerned, which, of course, is the hallmark of any use of totalizator equipment at a race track.

The equipment has flexibility. If, today, we want to sell a daily touble ticket, we have to move an entirely different machine into the line to sell it, from a regular machine. The machine that we have created for it, this Westbury Electronic totalizator, can be changed instantaneously, so that you can sell doubles, you can sell win, place, show, quinella. There's this flexibility which is of great value.

Of course, it cuts down the amount of investment that you must make in serving a race track because of the flexibility that we have in the equipment.

There is much more to commend the equipment. As a matter of fact, if you see the sign at the very end, of course, this is a very fanciful thing. Nevertheless, the scientists at Digi-

tronics Corporation, which is building this equipment for us, estimate that the chances of failure of this equipment is such that if there was a nail standing up somewhere on Long Island -- now, you know how large Long Island is -- if there was a nail standing up somewhere on Long Island, and you were driving a car all over Long Island, your chances of running over that nail are just what the chances are of this equipment failing.

This is largely not because of the fact that it's electronic solely, but because of the fact that every part of this system, as is the custom in electronics machinery, has a duplicate right alongside of it. Everything is done in parallel. So the very, very, very, very remote chances of failure on one side has to be balanced by a coincidental very, very remote chance of failure on the other. We believe that this is a practical, exclusive guarantee against any kind of failure or mistake.

MR. : Mr. Weil, would you say that with the possibility here of not only having more time, but in the future you could run the daily

double almost up to the time of racing, and also possibly have a tenth race, which would make more money in the future for the Track?

MR. WEIL: All of these things are possible. And it comes down to the increasing of the value of time, which is a commodity here.

Actually, in our operation, the operation is a time and traffic operation. We want to get people to the windows and back, away to watch the race, and back to the windows again. We have to give them circulation, and we have to give them the time to do it.

Now, if I may point out, the heart of this equipment -- and this, of course, amazes me -- the heart of this equipment is a little circular thing that could lie right in the center of the palm of your hand. We attempt to illustrate it by one of those cards where you see a red square and the picture of a hand. Can you make it out? It's the sixth card over. There's a red square, and in the center of the palm of the hand, there is what you can see, which is supposedly the heart of this machinery. This is the memory,

this is -- or a number of these, of course, is what takes together all of this information, holds it, sorts it, and then puts it out when needed.

Now, of course, to most of us the mysteries of electronics are a never-ceasing wonder. But the fact that this can be done with this equipment is something that is extremely impressive and something which illustrates the other uses to which this equipment can be put.

As a corollary to having this equipment in our plant -- when, as and if we have it -- we will be able to do all of our accounting work with the computer, which is a part of it. Now, this is another very important time and money saving apparatus.

Beyond this, there are many other things which are coming into focus for the use of this machinery. I would like to let you know that in December of this year we expect to have the first model of the machinery standing at Roosevelt Raceway so that we can subject it to the most vigorous of tests, so that we can show it to all the people who are interested in it.

I believe that shortly thereafter we will find ourselves in business with the totalizator equipment. And where this can go and how far it can go, I can't tell you. We know that right now the entire United States is under almost a monopoly of the American Totalizator Company, which is a branch of Universal Controls. But we know, too, that they do not have, and if they start now it will take them several years to have, all of the things that we now have in this equipment.

We know this: We know that the racing business, as I stated at the beginning, is a matter of continually attempting to cut your costs, continually cutting your costs, trying to do things more efficiently, trying to be able to spare manpower.

It is a fact that all of the tracks all over the country are subjected to state taxes on their handle, and state taxes on their admissions, or some of them. Nevertheless, the taxing authority of the state, the revenue-producing ability of racing, is such that the state leaves very

little for you, unless you are able to take care of yourself. If you just don't attempt in every possible way to control and to cut down and to hold down your expenditures, why, you find that you can't operate a profitable business.

Here, a machine such as this, that will permit the release of a number of men from your plant, and also a number of men that are necessary to maintain equipment, it will be more economical by virtue of a cheaper rental, this is something that we know is going to appeal to many operators like ourselves.

We have great confidence in this, too. And we have great confidence that within the next few years we will start to make ourselves seen and heard throughout this entire United States, and perhaps elsewhere in this world.

MR. LESSER: You said that we have all the selling rights throughout the United States, and perhaps throughout the world.

MR. WEIL: All over the world.

MR. LESSER: Now, I have a book here, mailed out by Digitronics, in which they state

they have the control over the rights in the State of New York.

MR. WEIL: Digitronics Corporation reserves unto itself the right to serve the equipment in the Greater New York Association. Aside from that the entire world is ours.

MR. LESSER: Then there is a --

MR. WEIL: Yes.

MR. LESSER: Does that take Roosevelt Raceway out?

MR. WEIL: I don't believe it does. Because of the fact that the operation of this equipment now is reaching a stage where Digitronics and Roosevelt are participating together.

MR. LESSER: Yes. Even though they are participating together, if they have the rights, and they alone have the rights to sell Yonkers, or Belmont, or Aqueduct, or Roosevelt, this particular system, they are going to keep those rights. Do they have the right to --

MR. WEIL: They have the right to sell the New York Racing Association -- that's Aqueduct, Belmont and Saratoga, that's all.

MR. LESSER: You didn't mention that, but that's all right.

MR. WEIL: Yes.

MR. LESSER: What I would like to have done now, if you please, is to read that part of the minutes that I mentioned before.

MR. WEIL: "This is another opportunity which we have in this company: We have been seeking some way to reduce the cost of our totalizator operation. As you know, we rent from the American Totalizator Corporation. They rent these to all race tracks throughout the United States. About nine or ten years ago we attempted to develop a tote and we invested perhaps $75,000 in the effort to have it done, but had to abandon it.

"Several years ago we discussed the matter of a totalizator with a small electronics company of Westbury, Long Island, a small company that has grown mightily since then. We made an agreement with them whereby they would produce a prototype of an electronic totalizator with issuing equipment which would be competent to operate the mutuels at Roosevelt Raceway or, for that

matter, at any race track in the country. They have worked on this for some time, and they have just completed a prototype of this equipment which we have seen in operation. It operates to the fullest extent we would require. At the moment it is custom built.

"We have had to close minutes before the race in order to make the necessary computations in this complicated pool. With this we would be able to sell until the very minute the horses go off. This is accomplished through the most advanced methods of computation possible.

"It is a company which has grown greatly in the few years we have had contact with them. We have had every component of this machinery fully tested. We have only prototypes, handmade, now. But when they are put into working models, fully tested, we believe it will be adequate for our purposes at Roosevelt Raceway.

"In the meantime, in order to assure continuity of service -- " have I covered the part that you want?

MR. LESSER: No. Please go on.

MR. WEIL: "In the meantime, in order to assure continuance of service, we have a contract with the American Totalizator Company which has five years to run. During this period we expect we will be able to develop, test and prove this equipment, and we will be able, perhaps, to sell it or lease it to other tracks, so that when our contract expires we will be able to install this device and thereby save our rental to the American Totalizator Company of approximately $600,000 a year. It is based on a percentage. If our business increases it could become more.

"I believe we will be able to acquire all of the necessary equipment to operate this plant for a sum far less than that and we will be able to save considerable moneys in our operation, in addition to which we have formed a new company, Westbury Electronics, which will engage in the sale, leasing and distribution of this equipment throughout the world. We have high hopes that this may lead to many opportunities for Roosevelt Raceway."

MR. LESSER: I might ask, now, when was this company formed, Mr. Weil?

MR. WEIL: Westbury Electronics?

MR. LESSER: Corporation; yes.

MR. WEIL: In 1960. April 6th, 1960.

MR. LESSER: Yes, I have that here. April 6th, 1960.

At that time, or before Roosevelt Raceway bought into Westbury Electronics, did anybody have any, did any officers or director own any stock in Westbury Electronics?

MR. WEIL: You don't mean Westbury, you mean Digitronics.

MR. LESSER: I mean, number one, Westbury Electronics, and also, I will come to that. I ask first of the Westbury Electronics.

MR. WEIL: Westbury Electronics was formed, and there are two shareholders in Westbury Electronics. They are Roosevelt Raceway, Inc., which owns 51 per cent of the shares, and Digitronics Corporation, Inc., which owns 49 per cent of the shares.

MR. LESSER: Then the question is: Before

BEST COPY AVAILABLE

this deal was made with Digitronics to produce this, was any officer or director a holder of shares of Digitronics?

MR. WEIL: Unfortunately, no. This is one of the greatest companies in the United States for growth. I have since become a stockholder in that company, and I would advise everybody within the sound of my voice to do so.

MR. LESSER: And a director.

MR. WEIL: Not of Digitronics. Of Westbury Electronics, which is our company.

MR. LESSER: No, of -- Chairman of Digitronics.

MR. WEIL: No. Of Westbury Electronics, in which we have --

MR. LESSER: I beg your pardon.

MR. WEIL: I represent this Company's interest in Westbury Electronics.

MR. LESSER: I see. I beg your pardon.

MR. WEIL: Did I answer your question, Mr. Lesser?

MR. LESSER: Yes, sir.

MR. WEIL: Mr. Levy insists that I tell

you that I am the owner of 400 shares of that stock. I wish it was 400,000.

MR. WALTER ANDERSON: Lehman Brothers picked up 25,000 shares of Digitronics.

MR. WEIL: I know that, sir. As a matter of fact, this company, it is expanding so rapidly, that they are constantly under the need of arranging for new funds.

Only last week or so Lehman Brothers, I believe Morgan Guarantee Pension Fund, represented by the Morgan Guarantee Trust Company, and two other very large institutional buyers, bought $1,200,000 worth of their stock.

MR. NATHAN HANF: When do you anticipate having this installation in operation at Roosevelt Raceway?

MR. WEIL: Well, sir, that's difficult to say. We would certainly be able to do it soon. We are hoping that circumstances will develop that we may be able to do it sooner. But we have a contract which may be binding and which may prevent us from doing this.

MR. LESSER: On the same topic, in your

Notation 3 here, you say Roosevelt Raceway acquired its 51 per cent on May 2nd, 1961. Is that correct?

MR. WEIL: I believe it is.

MR. LESSER: And Digitronics said they came into it and made an agreement on May 1st, 1961, before we even acquired it.

MR. WEIL: You know, after all, this is something -- it may be that there's a confusion in the dates there, Mr. Lesser. I don't know that the five days difference makes any matter to anybody.

Certainly, the arrangement is simple enough, and clear enough. And if the date is May 1st or May 6th, I don't think it's material.

Do you think it's material, Mr. Lesser?

MR. LESSER: No; not too much.

MR. WEIL: Then why do you raise it and waste the time of five hundred people in this room?

MR. LESSER: I am not wasting anybody's time. I am a stockholder and interested in my interest in Roosevelt Raceway, Mr. Weil, the same as you are in Digitronics, and Roosevelt Raceway.

BEST COPY AVAILABLE

[redacted]

A511

MEMORANDUM

PANEL DISCUSSION AT PHOENIX ON NOVEMBER 29, 1962

Moderator: James Stewart

Inquiring Mutuel Managers: Walger - NYRA
Haines - Southern California
Mullins - Phoenix

Representing Tote Companies: Levy - American Tote
Boa - Australian Tote
Leonard - Digitronics
Kaiser - Swedish Tote

The meeting opened with Mr. Stewart introducing the Panel to the audience and explaining the primary reason for this Panel. Mr. Stewart also explained that this would be a two-phase discussion.

Walger: I inquired of Mr. Levy of the American Totalisator Company as to what had been accomplished relative to research from the meetings held with a TRA liaison subcommittee of which I was chairman August 1959 thru December 1960. Mr. Levy was told at that time there had been many requests from a group of mutuel managers for items which they were anxious to acquire. It was explained that while the American Tote machinery was operating efficiently, there were many devices and new applications which might be helpful and had been requested as outlined in the memorandum of the August 1959 meeting, which was read. In November 1959, the same committee held a meeting at the American Tote plant, at which time the mutuel managers were shown some of the development that had taken place and it was agreed these items would be shown at the 1960 TRA meeting which was held in New York.

Levy: Mr. Levy then told us of the various items mentioned in the memo of August 1959 that had been developed, some of which we had received, but made it very clear that there was an economic cost in realigning the equipment to do all of the improvement requested.

Stewart: Mr. Stewart then opened phase two of the discussion by introducing Mr. Kaiser of the Swedish Tote, asking him to elaborate on the many improvements that would be incorporated in their new installation. Mr. Kaiser replied that there would be incorporated in their new tote automatic code, race change, printed sales, and reset; also, rolls of paper large enough for a day's business. This would eliminate the manual work performed by machine supervisors and summary writers. He informed us that there would be a binary printout, a

P80

built-in price computer with summaries of sales in tickets and dollars. There would also be an accumulated summary board for daily double as well as race sales. At this point I asked Mr. Kaiser if the prices of this price computer would be guaranteed and his answer was "yes". He mentioned that in their opinion this tote installation when completed would be considerably less expensive than the present tote used.

Boa: Mr. Boa stated that all of the many things that had been said by Mr. Kaiser concerning his tote equipment could practically be said of the Australian Tote equipment in use now at most of the 200 installations throughout the world and, with the exception of the North American continent, they had the largest number of installations in all of the other countries. He also mentioned that all of their machinery would sell four ways: Win, Place, Show and Double. He mentioned that they had installations of 400 to 500 TIMs in South America. He informed us he had sold TIMs to Digitronics Company to be used in 1963.

Leonard: Mr. Leonard informed the panel that of the many modern installations of Digitronics Company, such as printing the N. Y. Times in Los Angeles and Paris by automation, there was a printout on all of their TIMs on tape which could be used at any time or stored and used if and when necessary; that they too had automatic prices, a record of denominational wagering on all horses, automatic codes, and paper rolls large enough to operate throughout any given race day without change of paper. He said that his company had already purchased 110 TIMs from the Australian Totalizator Company of Sydney, Australia, and they were presently adapting them to their new tote, that there would be a complete display in mid-February of this new Digitronics Tote at Roosevelt Raceway and we were invited to attend this display. Mr. Leonard further advised us that they were working on validation of tickets at the cashier's window and automatic cashier, but did not elaborate on this subject. When questioned regarding this subject he said it was in research for the future.

Levy: Mr. Levy stated that all of the information that he had heard today from the three other totalizator companies could be done by the American Tote, but it was economics that had a great deal of bearing on the accomplishment of this. He mentioned that they had had automatic code changes many years ago but had discontinued the use of same because it was generally decided that a manual application of the code gave greater security and many more thousands of usable code words, and that the codes they use now were under lock and key until the day and race of use. He mentioned the fact that they had already serviced several areas, including New York, with machines equipped to use larger rolls of paper than formerly used.

Mr. Stewart then asked the inquiring Managers if they had any further comment regarding the panel here this morning, and my answer was that I had heard a lot of interesting conversation relative to what was being done in the totalizator field, and the many advancements that had been projected here today were music to my ears, but I had to inform these gentlemen that I could not visualize much from an artist's conception or a brochure, also that conversation would not suffice for me. I felt I was qualified to speak for NYRA that when any company had completed any tote which they thought would be of interest to us, we would go anywhere at any time to look at it.

Meeting Adjourned.

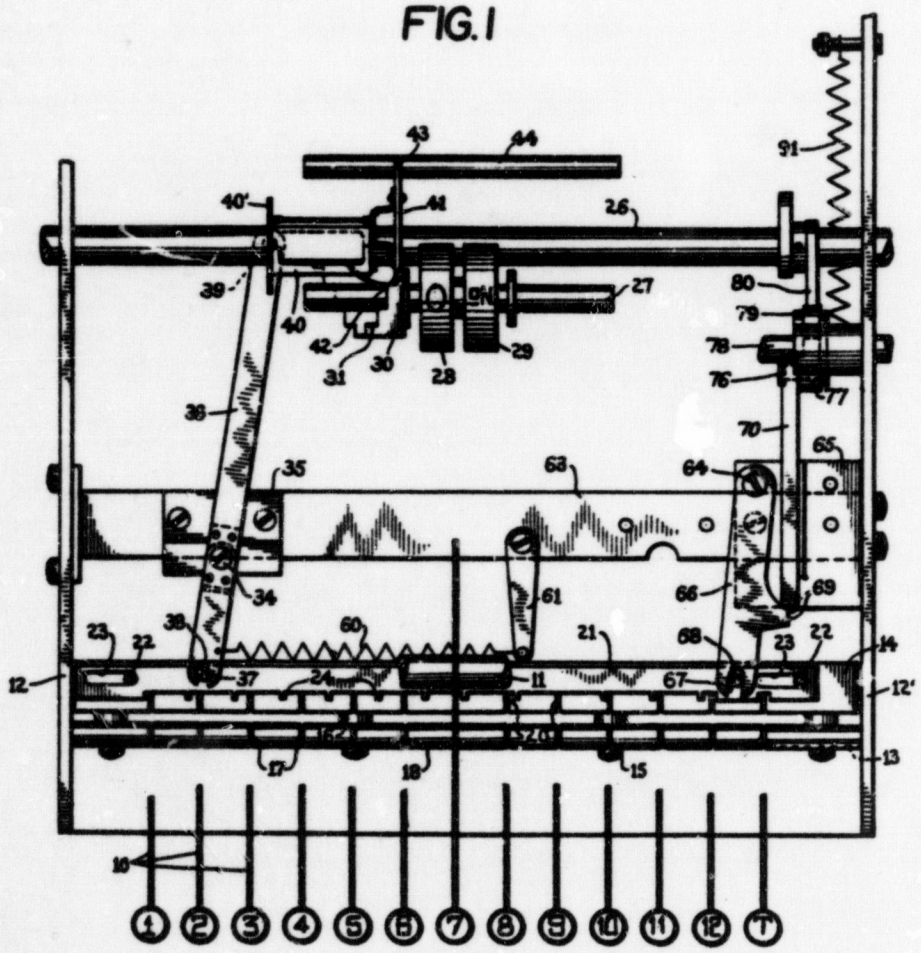
A514

Sept. 8, 1953 A. J. JOHNSTON 2,651,253

KEY SELECTOR MECHANISM IN PRINTING MACHINES

Filed April 20. 1948 3 Sheets-Sheet 1

FIG. 1



INVENTOR.
ARTHUR J. JOHNSTON
BY
E. C. Sanborn
ATTORNEY

Sept. 8, 1953 A. J. JOHNSTON 2,651,253

KEY SELECTOR MECHANISM IN PRINTING MACHINES

Filed April 20, 1948 3 Sheets-Sheet 2

FIG.2

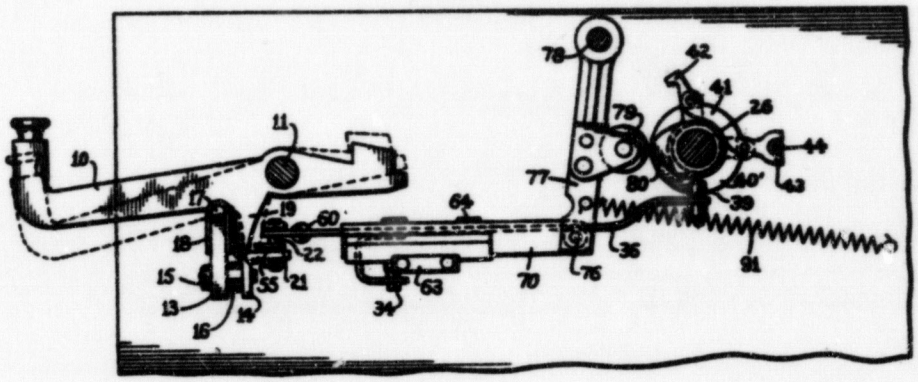
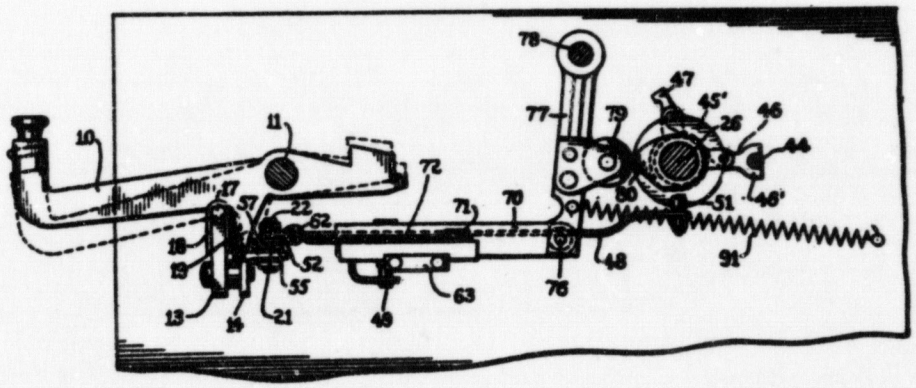


FIG.4



INVENTOR.
ARTHUR J. JOHNSTON
BY
E. C. Sanborn
ATTORNEY

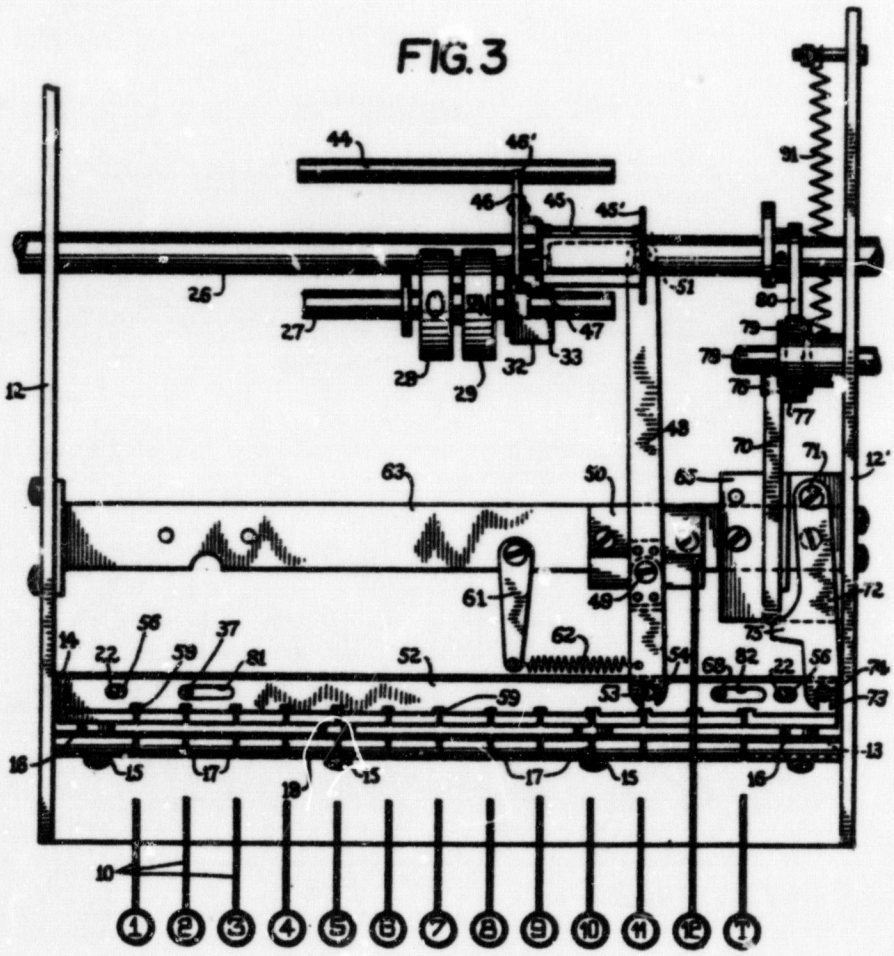
A516

Sept. 8, 1953 A. J. JOHNSTON 2,651,253

KEY SELECTOR MECHANISM IN PRINTING MACHINES

Filed April 20, 1948 3 Sheets-Sheet 3

FIG. 3



INVENTOR.
ARTHUR J. JOHNSTON
BY
E. C. Sanborn
ATTORNEY

Patented Sept. 8, 1953

2,651,253

UNITED STATES PATENT OFFICE

2,651,253

KEY SELECTOR MECHANISM IN PRINTING MACHINES

Arthur J. Johnston, Ruxton, Md., assignor to American Totalizator Company, Inc., Baltimore, Md., a corporation of Maryland

Application April 20, 1948, Serial No. 22,697

7 Claims. (Cl. 101—93)

1

This invention relates to totalizator ticket issuing machines, and is particularly concerned with the provision of novel and improved selector mechanism for controlling the printing operation. Machines of this type (as exemplified in the patent to Black, No. 1,886,626, dated November 8, 1932) embody a printing head carrying type wheels settable to different positions determined by depressed keys for the purpose of printing the number of an entry in a race in connection with which tickets are issued from the machine as receipts for bets. As illustrated in the aforementioned Black patent, each of the keys is provided with one or more abutments, the lengths of which are different for different keys, to control the extents of movement of selector elements for determining the positions to which the type wheels shall be set.

The present invention provides new and improved key-controlled selector mechanism, especially adapted for totalizator ticket issuing machines, whereby the positions of the type wheels are determined in a simple, effective, and expeditious manner.

One of the advantages of the invention is that the keys may all be of identical shape, so that all may be formed through a single die.

A more specific feature of the invention resides in the provision of a selector bar having a plurality of shoulders, and movable transversely with respect to a plurality of keys, each of which keys has a portion movable into the path of a corresponding shoulder of the bar upon depression of the key to determine the extent of movement of the bar in accordance with the designation represented by the key.

The invention also comprises, as a further more specific feature, a plurality of groups of numeral keys, one representing numerals in one denominational order and another group representing numerals in a plurality of denominational orders including the first mentioned order, in combination with a plurality of selector bars, one of which bars is movable through extents determined by the keys of either group, and the other through extents determined by the keys of the second group, for determining the positions of type wheels of different denominational orders.

Other features of the invention will be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a top plan view showing type wheels of units and tens orders in a conventional printing head, together with mechanism embodying my invention for determining the setting of the wheel of units order.

Fig. 2 is an elevational view, with parts in vertical section, of the apparatus illustrated in Fig. 1.

Fig. 3 is a top plan view similar to Fig. 1 but showing mechanism embodying my invention for

2

determining the setting of the type wheel of tens order.

Fig. 4 is an elevational view, with parts in vertical section, of the type wheel selector mechanism of Figs. 1 and 3.

Referring to the drawings, a series of operating keys 10 are pivotally mounted upon a rod 11, carried by plates 12, 12' of the machine frame. Also carried by said plates is a supporting bar 13, on which is mounted an angle bracket 14 through screws or bolts 15. Said bracket 14 is suitably spaced from the supporting bar 13 by washers 16 surrounding said bolts.

As is customary in apparatus of this type, means are provided for preventing the depression of more than one key at a time. Such means may take the usual form of a row of balls 17. The latter are shown positioned on top of the supporting bar 13. Said balls 17 provide a total free space therebetween sufficient to permit the depression of only one key lever at any given time. The balls may be maintained on the top of the bar 13 in any suitable manner, as by retainer members 18, of inverted U-shape, spaced from each other by distances approximately equal to the widths of the key levers. In Fig. 1, the key lever No. 7, which is shown depressed, has entered the space between adjacent retainers 18 and has filled the available space between the balls 17. The latter fill the spaces between the other retainers so that no other key can be depressed until key No. 7 is released.

Each key lever is provided with a downwardly extending projection 19, movable in a corresponding one of a series of slots 20 in the horizontal or top portion of the angle bracket 14. A selector bar 21 is slidably mounted on said horizontal portion of said bracket, through pins 22 projecting upwardly from said bracket into elongated slots 23 in said selector bar. Said bar is notched in its forward edge to provide shoulders 24 for cooperation with the projections 19 of the various key levers. The first of said shoulders 24 (at the left in Fig. 1) is spaced a given distance from the projection 19 of the key No. 1; while the succeeding shoulders 24 of the first nine shoulders of said bar 21 are spaced progressively increasing distances from the projections 19 of the corresponding key levers. In other words, when the key No. 1 is depressed, movement of the bar 21 through a given distance to the right (Fig. 1) will bring the first shoulder 24 into engagement with projection 19 of said key No. 1. When key No. 2 is depressed, the bar 21 moves to the right through twice the above mentioned distance before its second shoulder engages projection 19 of key No. 2. And when key No. 9 is depressed, the bar 21 moves to the right through nine times the distance that it moves in response to depression of key No. 1, i. e.,

until its ninth shoulder 24 engages projection 19 of said key No. 9. Thus, the extent of movement of the selector bar 21 in response to depression of any of the first nine keys is commensurate with the value represented by said key.

A shaft 26, set into rotation is well known manner by depression of any of the keys 19, carries a conventional printing head (such as that shown at 17 in the aforementioned Black patent). Said printing head includes a rod 27 on which are rotatably mounted a pair of type wheels 28, 29. The type wheel 28 of "units" denominational order, has ten facets upon which are inscribed the numerals from 0 to 9. Type wheel 29 of "tens" denominational order, has facets, one of which bears the inscription "No.," another the numeral 1, and a third the word "Test." Said "tens" order wheel 29 may, of course, bear additional numerals, depending upon the number of keys, which in turn depend upon the maximum number of races for which the machine is to issue tickets. In the present embodiment exemplifying the invention, there are shown twelve numeral keys and one test key marked "T." Hence the type wheel 29 of tens order need bear no numeral higher than "1" in this embodiment.

Fixed to the type wheel 28 is a stepped cylinder 30 having a series of abutments 31 corresponding in number and disposition to the facets on said type wheel. A similar stepped cylinder 32 having abutments 33 is fixed to the type wheel 29.

Pivotally mounted through a pin 34 on a block 35 is a lever 36, connected at one end to the selector bar 21 through a pin 37 on said bar and a notch 38 in said lever. The opposite end of said lever is connected through a trunnion fork 39 to a plate 40' at one end of a sleeve 40, which is slidable on the shaft 26. At its other end, said sleeve has secured thereto an arm 41 having a stop portion 42 movable with said sleeve to positions opposite any one of the abutments 31 of the type wheel 28. Said arm 41 also has a forked portion 43 (Fig. 2) engaging a rod 44 of the printing head, so that the sleeve 40 is always maintained in fixed rotational relationship with the rods 44 and 27 of the printing head during the rotation of said head with the shaft 26.

Similarly a sleeve 45 (Fig. 3), slidable on the shaft 26, is provided with an arm 46 having a stop portion 47 movable with said sleeve into positions opposite any of the abutments 33 of the type wheel 29. The arm 46 is also provided with a forked portion 46' which engages the aforementioned rod 44. A lever 48, pivoted at 49 on a block 50, is connected at one end to said sleeve 45 through a trunnion fork 51 engaging a plate 45' at an end of said sleeve. Said lever is connected at its opposite end to a selector bar 52 (more specifically described hereinafter) through a pin 53 on said bar and a notch 54 in said lever.

The printing head, and type wheels 28, 29, stepped cylinders 30, 32, and sleeves 40, 45, may be of the same construction as illustrated in the Black patent hereinbefore referred to. Also, the keys 19 cooperate with means such as illustrated in said Black patent whereby, upon depression of any of said keys, the shaft 26 is set into rotation through one complete revolution and is automatically stopped at the end of the revolution. Such means, being shown in said Black patent and well understood in the art, need not be here disclosed.

The selector bar 21 may conveniently be mounted on washers or other suitable bearing members, such as shown at 55 in Figs. 2 and 4, on the bracket 16, through which washers the pins 22 extend. The selector bar 52 is mounted above the bar 21, as shown in Fig. 4, and is provided with elongated slots 56 (Fig. 3) through which extend said pins 22. Washers 57 (Fig. 4), surrounding the pins 22, may also be interposed between the selector bars 21 and 52.

Of the keys 19, those numbered 1–9, inclusive, in the annexed drawings are in the "units" denominational order, while those numbered 10, 11, and 12 each contain one digit in the "units" order and another digit in the "tens" order. The shoulder 24 of the selector bar 21 which cooperates with the projection 19 of the key bearing the numeral 10, is so positioned as to permit practically no movement of said bar when said No. 10 key is depressed. The shoulder 24 which cooperates with key No. 11 is positioned to engage projection 19 of that key, following depression of the latter, when the bar 21 moves to the right (Fig. 1) through a distance representing one unit, i. e., the same distance as that through which said bar moves in response to depression of the No. 1 key. The shoulder 24 cooperating with key No. 12 is positioned to engage projection 19 of that key, following depression of the latter, when the bar 21 moves to the right through a distance representing two units. Thus, upon depression of any key in the group comprising keys bearing the numerals 10–12, the position of the bar 21 corresponds to the digit of "units" order in the numeral on said key. The shoulder 24 cooperating with the key marked "T" is positioned to engage the projection 19 of that key, upon depression of the latter, without permitting any substantial or significant movement of the selector bar 21.

The selector bar 52 is notched to provide shoulders 59 for cooperation with the various keys. The shoulders 59 cooperating with the keys of units order (i. e., those bearing the digits 1–9) are so positioned with respect to the key projections 19 that no substantial or significant movement of said bar 52 takes place when any of those keys is depressed. However, the shoulders 59 which cooperate with the keys bearing the numerals 10–12 are so positioned that, following depression of any of said keys, the corresponding shoulder 59 engages the projection 19 of the depressed key upon movement of the bar 52 to the left (Fig. 3) through a distance of one unit. In other words, depression of any of the keys 1–9 (none of which has a digit of "tens" order) produces no movement of selector bar 52; but depression of any of keys 10, 11, and 12 (having digits of both "units" and "tens" orders) results in movement of bar 52 to the left (Fig. 3) through one unit of distance, corresponding to the digit 1 in the "tens" order of the number represented by the depressed key. The shoulder 59 cooperating with the projection 19 of key "T" permits movement of bar 52 to the left through two units in response to depression of that key.

As previously observed, the selector bars 21 and 52 are connected, through the respective levers 36 and 48, to stop members 42 and 46 for determining the positions of the respective type wheels 28 and 29. The means for moving said selector bars, and thereby the type wheel stops, to positions determined by any depressed key, will now be described.

A spring 60, connected at one end to the lever 36 and at its other end to a stationary arm 61, constantly urges said lever 36 in a counter-clockwise direction (Fig. 1) and thus urges the selector bar 21 to the right. A spring 62 (Fig. 3), connected at one end to arm 61 and at its other end to

lever 48, constantly urges said lever in a clockwise direction, urging the bar 52 to move to the left. The arm 61 may conveniently be secured to a bar 63 fastened to the frame plates 12, 12', which bar may also carry the previously mentioned lever-supporting blocks 25 and 56, as shown.

Pivoted at 64 on a block 65 carried by the bar 63 is an arm 66, having a notch 67 at one end which engages a pin 68 on the selector bar 21. Said arm 66 has a cam portion 69 projecting from one side thereof. Slidably mounted in a groove in the block 65 is a plunger 70 adapted to engage the cam surface of the projection 69. In the position of the parts shown in Fig. 1, said plunger 70, through its engagement with said cam surface, prevents movement of the selector bar to the right.

Also pivoted on the block 65, as shown at 71 (Fig. 3) is an arm 72 having a notch 73 at one end which receives a pin 74 on the selector bar 52. Said arm 72 has a cam portion 75 projecting from one side thereof and engaged by said plunger 70. In the position of the parts shown in Fig. 3, the plunger 70, through its engagement with the cam surface of the projection 75, prevents the selector bar 52 from moving to the left.

The plunger 70 is pivotally connected at 76 to a lever 77, which is pivoted on a rod 78 mounted in the machine frame. Said lever 77 carries a cam follower or roller 79 which engages a cam 80 secured to the shaft 26. A spring 81 continuously maintain said roller in engagement with said cam 80.

The selector bar 52, which as above noted is mounted above the bar 21, is provided with slots 81, 82 (Fig. 3) through which project the pins 37 and 58 of said bar 21. Thereby the selector bar 21 is freely movable to its various positions without interference by the overlying bar 52.

The operation of the apparatus above described may be summarized as follows:

When no key is depressed, the parts stand in the positions indicated in Figs. 1–4, with their projections 19 outside of the notches in the selector bars 21 and 52. When, however, a key is depressed, into the dotted line position in Fig. 2 or 4, its projection 19 moves into the notches or spaces between adjacent shoulders in said selector bars. Also, as noted hereinbefore, depression of any key sets the shaft 26 into rotation. Thus, the cam 80 is rotated, moving its high point away from the lever 77 so that the spring 81 draws said lever towards said shaft. This movement of the lever draws the plunger 70 toward the shaft 26, releasing the levers 66 and 72 and freeing the selector bars 21 and 52 for operation by the respective springs 69 and 62.

Assuming, for example that the key bearing the numeral 7 is depressed, the selector bar 52 will not be operated, despite the retraction of the plunger 70, since the projection 19 of said depressed key prevents movement of said bar. However, the selector bar 21 is drawn to the right by its spring 62, until its seventh shoulder 24 engages said projections 19, at which time said bar 21 has moved through seven steps. This movement of said bar shifts the sleeve 40 and stop 42 axially along the shaft 26 into the proper position for stopping the type-wheel 28 when the latter is rotated sufficiently about the shaft 27 to bring the numeral type "7" into printing position. The stepped cylinders 30 and 32 attached to the respective printing wheels 28 and 29, are continuously urged into engagement with the respective stops 42 and 47 by coil springs housed within said wheels, as shown in the previously mentioned Black patent; and thus the movement of either stop 42 or 47 along the shaft 26 results in rotation of the associated type wheel 28 or 29 about the axis of the rod 27 to bring into printing position the type corresponding to the new position of said stop.

As previously noted, the printing head which carries the type wheel is carried by the shaft 26. As in said Black patent, said printing head rotates with said shaft 26, bringing the type wheels into contact with an inking roller and thence into engagement with a ticket (previously automatically severed from a ticket web) so that said type wheels print upon said ticket and the latter is then ejected from the machine. The indicia printed by the type wheels upon the ticket are those which register with the surface of revolution generated by the printing head (or "printing cylinder" as it is designated in said Black patent) carried by the shaft 26. When no key is depressed, the numeral "0" on type wheel 28 is in register with said surface of revolution, as is the designation "No." on the type wheel 29. When, however, the key No. 7 was depressed, as aforementioned, the shifting of the stop 42 to the corresponding position on the shaft 26 allowed the type wheel 28 to be rotated by its spring until the numeral type "7" was brought into register with said surface of revolution; at which time a corresponding abutment 31 on the stepped cylinder 30 engaged said stop 42. The type wheel 29 did not rotate, however, since its cooperating stop 47 was not shifted, and so its designation "No." remains in register with said surface of revolution. Thus the indicia "No. 7" are printed upon the ticket pursuant to depression of the key bearing the numeral 7. As in said Black patent, the printing and issuing of the ticket occur in a single revolution of the shaft 26 (the latter corresponding to the shaft designated 16 in said patent, the stops 42 and 47 to stops 66, the stepped cylinders 30 and 32 to cylinders 59, and the type wheels 28 and 29 to wheels 57 and 58).

Similarly, if any other key of the group bearing the numerals 1–9 is depressed, the selector bar 21 shifts the stop 42 for stopping the type wheel 28 in the position for printing the corresponding numeral on the ticket, in conjunction with the designation "No." from the type wheel 29.

If the key bearing the numeral 10 is depressed, the selector bar 21 does not move, despite the retraction of plunger 70, since movement of said bar by its spring 60 is blocked by the projection 19 of said depressed key in cooperation with the adjacent shoulder 24 of said bar. However, the selector bar 52 is drawn one step to the left (Fig. 3) by its spring 62 and the stop 47 for the type wheel 29 is correspondingly displaced on the shaft 26. The type wheel 29 is thus rotated by its spring through one step, until the corresponding abutment on the stepped cylinder 32 engages said stop 47, bringing the numeral "1" on said wheel into printing position, i. e., into registry with the surface of the revolution generated by the printing head in its rotation with the shaft 26. The type wheel 28 has not been rotated about the axis of its rod 27, since the stop 42 has not been shifted, and thus the numeral "0" on said wheel remains in printing position. The No. "10" is thus printed on the ticket which is ejected from the machine.

If the key bearing the numeral "11" is depressed the selector bar 21 is shifted one step to the right by its spring 68 as the plunger 76 is withdrawn, and concurrently the selector bar 52 is drawn one step to the left by its spring 62. Thereby both stops 42 and 47 are shifted along the shaft 26 and the type wheels 28 and 29 are rotated to bring the numeral "1" on each of said wheels into printing position so that the number "11" is printed on the ticket.

Similarly as key No. 12 is depressed the selector bar 21 is drawn two steps to the right by its spring 68, upon retraction of the plunger 76, and concurrently the selector bar 52 is drawn one step to the left by spring 62 so that the stops 42 and 47 are positioned for setting of the wheels 28 and 29 to print the number "12" on the ticket.

When the key bearing the designation "T" is depressed the selector bar designated 21 is not moved by its spring, since such movement is prevented by projection 19 of said key in cooperation with the adjacent shoulder on said bar. However the bar 52 is drawn two steps to the left by its spring 62, thus positioning the stop 47 to allow the type wheel 29 to rotate through two steps, bringing its type "Test" to printing position. The designation "Test 0" is thus printed on the ticket when the test key "T" is depressed.

During the latter part of the revolution of the shaft 26 in response to the depression of any key, either or both of the type wheels 28, 29 displaced from normal position are returned thereto by any suitable means, such as that disclosed in the aforementioned Black patent.

It will also be understood that means such as shown in said Black patent may be provided for locking a depressed key in depressed position, and underpressed keys in underpressed position, until a revolution of the shaft 26 has been completed. Each of said keys may, of course, be provided with a spring (such as shown at 2' in said Black patent) for returning any depressed key to underpressed position automatically upon its release.

It will be noted that all of the keys in the arrangement herein described may be of identical shape so that all may be formed by a single die. At the same time the stops for the type wheels are accurately and effectively set into position corresponding to depressed keys. The invention furthermore is readily applicable to totalizator ticket issuing machines such as illustrated in said Black patent, without change in the printing or ticket issuing mechanism or in the mechanism for starting and stopping the rotation of the shaft which carries the printing head.

It will also be noted that in the embodiment of my invention hereinbefore described, the movement of either of the selector bars 21 and 52 is transmitted directly to the corresponding type-wheel stop member 42 or 47 by a simple lever having a single fulcrum. The mechanism for setting the type-wheel stops pursuant to depression of a key is thus greatly simplified over that shown in the Black patent aforementioned.

The block 35 which carries the fulcrum 34 of the lever 36 may if desired be adjustably mounted on the bar 53, as may also the block 50 which carries the fulcrum 49 of the lever 48. In the drawings each of said blocks is shown secured to said bar 53 by screws or bolts passed through holes in said bar; and it will be apparent that any desired number of holes may be provided in said bar for the passage of said screws or bolts so that said blocks, and fulcrums 34, 49, carried thereby, may be mounted in any of a plurality of positions on said bar 53.

During the latter part of the rotation of the shaft 26 the cam 80 acts upon the roller 78 to restore the lever 77 and slide 76 to their positions shown in Figs. 1–4. During this restoring of the slide 76 to its aforementioned position said slide, through its engagement with the cam projections 69 and 75, restores the levers 66 and 72, and thereby the selector bars 21 and 52, to their normal positions shown in Figs. 1 and 2. Thus at the end of the cycle of rotation of the shaft 26 the plunger 76 and selector bars 21 and 52 are in their normal positions shown in the drawings, ready for another cycle of operation pursuant to depression of any one of the keys.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

I claim:

1. In a totalizator ticket-issuing machine having printing mechanism comprising an indicia-bearing printing element movable through different extents to bring the respective indicia to printing position, a plurality of depressible keys corresponding to said indicia, a bar movable transversely of said keys, said bar having a plurality of shoulders and each of said keys having a portion movable into the path of a corresponding shoulder of said bar upon depression of said key, said shoulders being spaced progressively varying distances from the corresponding key portions, means normally preventing shifting of said bar, means responsive to depression of any of said keys for withdrawing said preventing means to an ineffective position, means responsive to said withdrawal of said preventing means for shifting said bar to bring a shoulder thereof into engagement with the corresponding portion of the key depressed, and means controlled by said bar for determining the extent of movement of said printing element.

2. In a totalizator ticket-issuing machine having printing mechanism comprising an indicia-bearing printing element movable through different extents to bring the respective indicia to printing position, a plurality of depressible keys corresponding to said indicia, a bar movable transversely of said keys, said bar having a plurality of shoulders and each of said keys having a portion movable into the path of a corresponding shoulder of said bar upon depression of said key, said shoulders being spaced progressively varying distances from the corresponding key portions, means comprising a plunger normally preventing shifting of said bar, means responsive to depression of any of said keys for withdrawing said plunger to an ineffective position, means responsive to said withdrawal of said plunger for shifting said bar to bring a shoulder thereof into engagement with the corresponding portion of the key depressed, and means controlled by said bar for determining the extent of movement of said printing element.

3. In a totalizator ticket-issuing machine having an indicia-bearing printing element movable through different extents to bring the respective indicia to printing position, a plurality of depressible keys corresponding to said indicia, a bar movable transversely of said keys, said bar

having a plurality of shoulders and each of said keys having a portion movable into the path of a corresponding shoulder of said bar upon depression of said key, said shoulders being spaced progressively varying distances from the corresponding key portions, a cam member connected to said bar, a plunger normally engaging said cam member to prevent shifting of said bar, means responsive to depression of any of said keys for withdrawing said plunger to a ineffective position, means responsive to said withdrawal of said plunger for shifting said bar to bring a shoulder thereof into engagement with the corresponding portion of the key depressed, and means controlled by said bar for determining the extent of movement of said printing element.

4. In a totalizator ticket-issuing machine having an indicia-bearing printing element movable through different extents to bring the respective indicia to printing position, a plurality of depressible keys corresponding to said indicia, a bar movable transversely of said keys, said bar having a plurality of shoulders and each of said keys having a portion movable into the path of a corresponding shoulder of said bar upon depression of said key, said shoulders being spaced progressively varying distances from the corresponding key portions, a cam member connected to said bar, a plunger normally engaging said cam member to prevent shifting of said bar, means responsive to depression of any of said keys for withdrawing said plunger to an ineffective position, means responsive to said withdrawal of said plunger for shifting said bar to bring a shoulder thereof into engagement with the corresponding portion of the key depressed, and means controlled by said bar for determining the extent of movement of said printing element and means for causing said plunger to reengage said cam member and to operate the latter for restoring said bar to its normal position.

5. In a totalizator ticket-issuing machine having indicia-bearing printing elements movable through different extents to bring the indicia thereon to printing positions, a plurality of depressible keys corresponding to said indicia, a pair of movable bars controlled by said keys to determine the printing positions of said elements, cam members connected to said bars, a blocking element normally engaging said cam member to prevent movement of said bars, responsive to depression of any of said keys for withdrawing said blocking element to an ineffective position, means responsive to said withdrawal of said blocking element for positioning said bars in accordance with the key depressed, means controlled by said bars for determining the extents of movement of said printing elements, and means for causing said blocking element to reengage said cam members to operate the latter for restoring said bars to their normal positions.

6. In a totalizator ticket-issuing machine having a pair of numeral-bearing printing elements of different denominational orders, said elements being settable to bring different numerals to printing position, a plurality of numeral keys, one group of which represent numerals in the first of said orders, and another group of which represent numerals in both of said orders, a bar movable through extents determined by the keys of either group, a second bar movable through extents determined by the keys of the second group, means normally preventing movement of said bars, means responsive to depression of any key in either group for withdrawing said preventing means to an ineffective position, means on said second bar cooperating with any depressed key in the first group for prohibiting movement of said second bar notwithstanding said withdrawal of said preventing means, means responsive to said withdrawal of said preventing means for moving the first mentioned bar to a position determined by depression of any key in either of said groups, means responsive to said withdrawal of said preventing means for moving the second bar to a position determined by depression of any of the numeral keys in said second group, means controlled by said first bar for determining the setting of that one of said printing elements which is of lower denominational order, and means controlled by said second bar for determining the setting of the other of said printing elements.

7. In a totalizator ticket-issuing machine having a pair of numeral-bearing printing elements of different denominational orders, said elements being settable to bring different numerals to printing position, a plurality of numeral keys, one group of which represent numerals in the first of said orders, and another group of which represent numerals in both of said orders, a bar movable through extents determined by the keys of either group, a second bar movable through extents determined by the keys of the second group, cam members connected to the respective bars, an element normally engaging both cam members to prevent movement of said bars, and means responsive to depression of any key in either of said groups for withdrawing said element from engagement with both said cam members, means on said second bar cooperating with any depressed key in the first group for prohibiting movement of said second bar notwithstanding said withdrawal of said engaging element, means responsive to said withdrawal of said engaging element for moving the first mentioned bar to a position determined by depression of any key in either of said groups, means responsive to said withdrawal of said engaging element for moving the second bar to a position determined by depression of any of the numeral keys in said second group, means controlled by said first bar for determining the setting of that one of said printing elements which is of lower denominational order, and means controlled by said second bar for determining the setting of the other of said printing elements.

ARTHUR J. JOHNSTON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
476,319	Severy	June 7, 1892
660,959	Irish	Oct. 30, 1900
703,330	Wiswall	June 24, 1902
1,203,863	Ellis	Nov. 7, 1916
1,435,184	Skeri	Nov. 14, 1922
1,539,462	Carroll	May 26, 1925
1,645,209	Von Pein	Oct. 11, 1929
1,862,446	Webb	June 7, 1932
1,886,623	Black	Nov. 8, 1932

Certificate of Correction

Patent No. 2,651,253 September 8, 1953

ARTHUR J. JOHNSTON

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 9, lines 52 and 53, for "member" read *members*; line 53, after "bars," insert *means*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of November, A. D. 1953.

[SEAL]

ARTHUR W. CROCKER,
Assistant Commissioner of Patents.

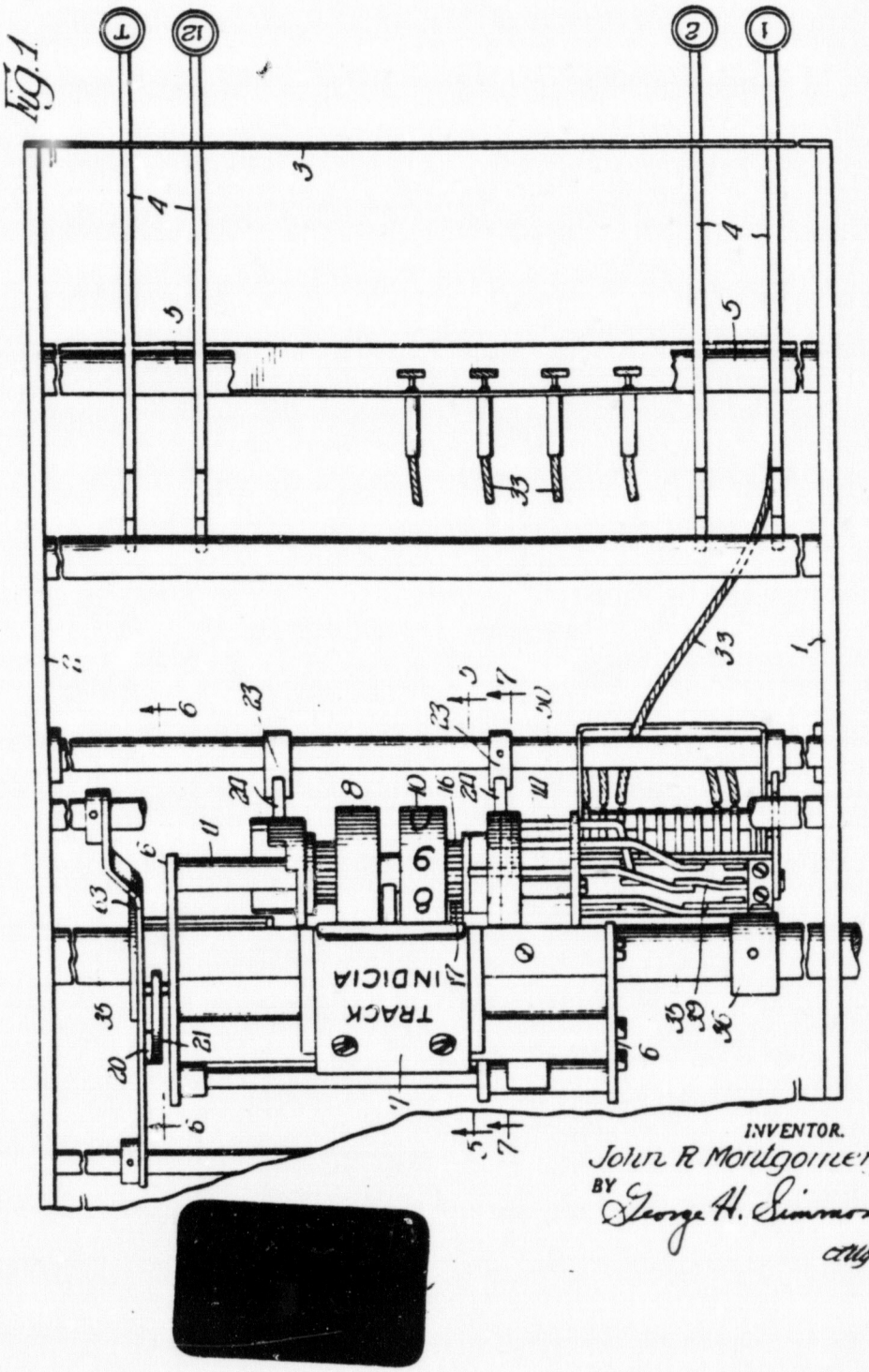
A523

April 29, 1952 J. R. MONTGOMERY 2,594,787

TICKET PRINTING AND ISSUING MACHINE

Filed Aug. 25, 1949 3 Sheets-Sheet 1

Fig. 1



INVENTOR.
John R. Montgomery.
BY George H. Simmons
Atty

A524

April 29, 1952 J. R. MONTGOMERY 2,594,787

TICKET PRINTING AND ISSUING MACHINE

Filed Aug. 25, 1949 3 Sheets-Sheet 2

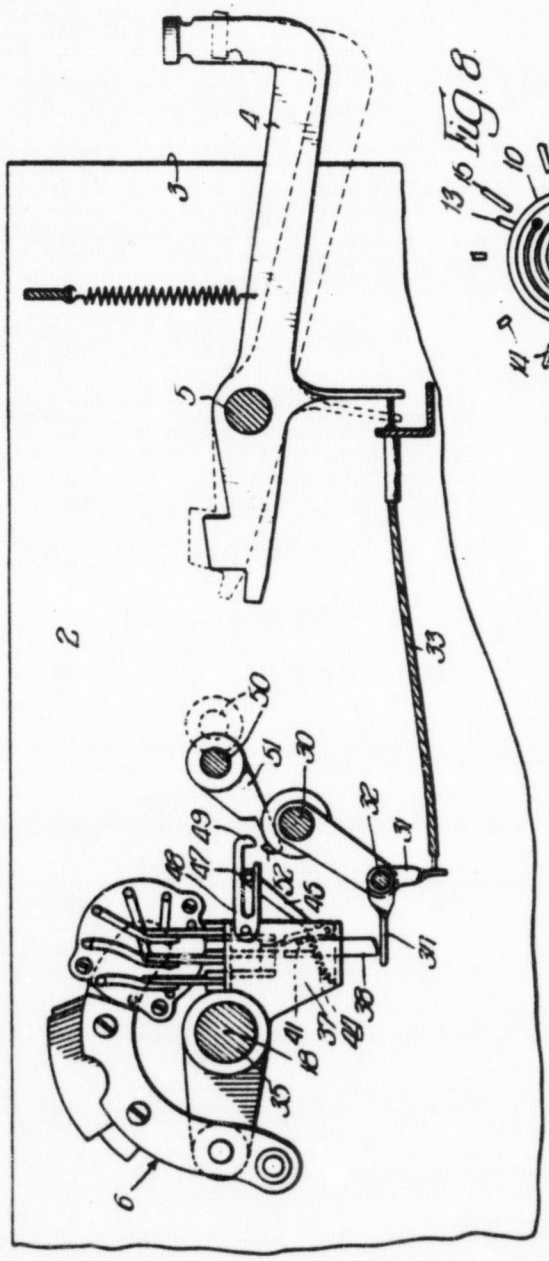


Fig. 2

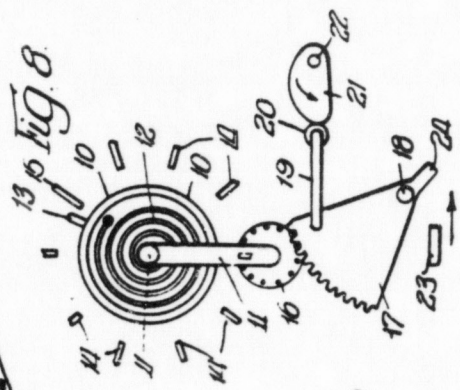


Fig. 8

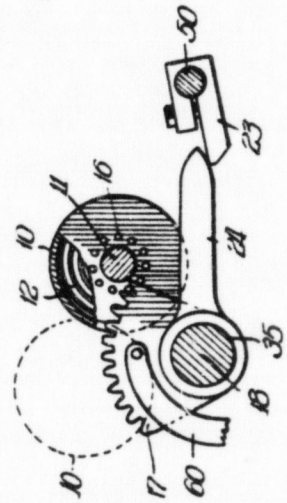


Fig. 7

INVENTOR.
John R. Montgomery
BY George H. Simmons
Atty

A525

April 29, 1952 J. R. MONTGOMERY 2,594,787

TICKET PRINTING AND ISSUING MACHINE

Filed Aug. 25, 1949 3 Sheets-Sheet 3

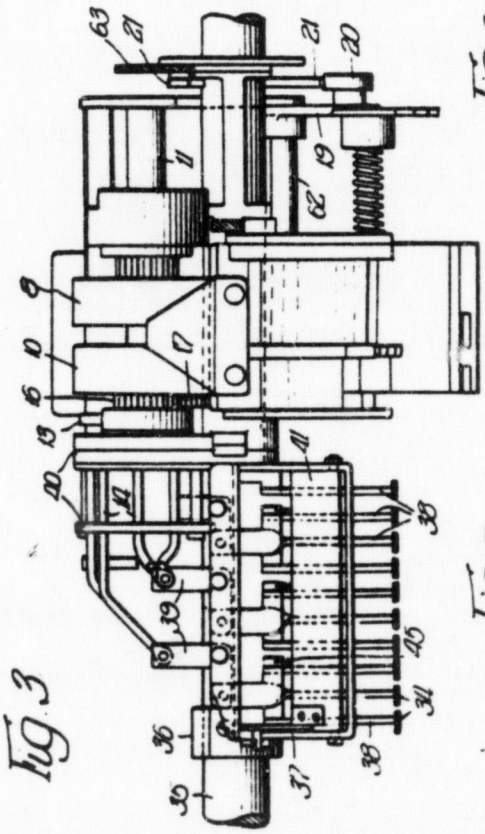


Fig. 3

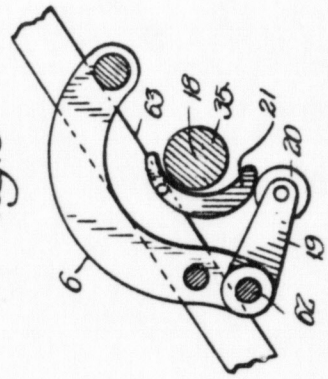


Fig. 6

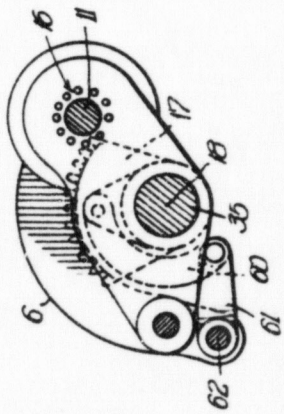


Fig. 5

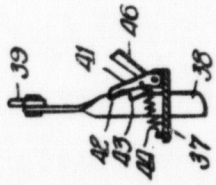


Fig. 4

INVENTOR.
John R. Montgomery.
BY George H. Simmons
Atty

A526

Patented Apr. 29, 1952

2,594,787

UNITED STATES PATENT OFFICE

2,594,787

TICKET PRINTING AND ISSUING MACHINE

John R. Montgomery, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application August 25, 1949, Serial No. 112,341

11 Claims. (Cl. 101—66)

1

This invention relates to ticket machines and has for its principal object the provision of a new and improved machine of this type.

It is a main object of the invention to provide, in a ticket machine adapted to print and issue a ticket bearing the number of an operated key, an improved mechanism for controlling the setting of the printing wheel responsive to the operation of a selected key.

Another object of the invention is to provide a control mechanism that is positive in its action and definitely prevents the printing of wrong-numbered tickets resulting from the missetting of the printing wheel due to bouncing of the wheel and/or wearing of the cooperating parts in the mechanism.

Another object of the invention is to provide a control mechanism in which the selection is determined by the location of a selecting part relative to the printing wheel and the selection made by movement of that part without altering its position relative to the printing wheel, rather than by the movement of that part a fixed distance from a non-operated to a selecting position.

Another object of the invention is to provide a selecting mechanism having a printing wheel stop bar for each position of the printing wheel, one of which bars is moved into operative position to control the setting of the wheel.

Another object of the invention is to provide a selection mechanism in which a stop bar that has been moved into operative position is locked in that position and remains there until another stop bar is moved to operative position, at which time it is unlocked and returns to normal.

Another object of the invention is to provide an improved control mechanism which can be incorporated in an existing machine with a minimum of alterations.

Another object of the invention is to provide a control mechanism that can be cheaply manufactured without sacrificing quality and can be maintained in proper operating condition at low cost.

Further objects of the invention not specifically mentioned here will be apparent from the description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown and in which:

Fig. 1 is a fragmentary top plan view of a ticket machine showing the invention;

Fig. 2 is a fragmentary side elevational view of the machine with one side plate removed;

2

Fig. 3 is a fragmentary elevational view showing the printing cage and control mechanism associated therewith;

Fig. 4 is a fragmentary detail view of the mechanism;

Fig. 5 is an end elevational view taken substantially along the line 5—5 of Fig. 1, looking in the direction of the arrows and showing the printing wheel control;

Fig. 6 is a fragmentary view similar to Fig. 5 but taken substantially along the line 6—6 of Fig. 1, showing additional details of the control;

Fig. 7 is a fragmentary view along the line 7—7 of Fig. 1, showing the reset mechanism; and

Fig. 8 is a diagrammatic view illustrating the modus operandi of the control mechanism.

Ticket machines adapted to be operated in response to an operation of a selected one of a plurality of keys to print and issue a ticket bearing the number of the selected key are available on the open market. It is to a machine of this type that the present invention particularly relates.

In one type of a machine of this kind now in common use, a cage carrying various indicia to be printed on the ticket is adapted to revolve through one complete revolution from a normal position back to a normal position in response to the operation of a key thereby to print and issue a ticket. In prior art machines of the type disclosed in Patents #1,886,626 and #1,886,627, issued to H. D. Black on November 8, 1932, the cage contains a pair of rotatable printing wheels mounted for rotation around an axis parallel to the axis of rotation of the cage. One of these wheels is adapted to print the tens digit of a key number, and other suitable indicia, when the number of the key that is operated is less than 10. The other of these wheels is adapted to print the units digit of numbers over 10 and the numbers of keys under 10.

In machines of the type covered by the Black patents, the printing wheels carry stepped cams and a single stop bar is moved longitudinally of the axis of rotation of the cage when the key is depressed. The position to be assumed by the printing wheel depends upon the step in the cam with which the stop bar is aligned. When the machine is tripped to initiate a revolution of the cage, a spring incorporated in the printing wheel revolves that wheel until the step cam engages the stop bar.

As will be apparent to one skilled in the art, in a selecting system of this kind where the selection to be made depends upon the amount of

linear travel made by a selecting bar, any play in the linkage between the key and the stop bar may result in lost motion and a consequent mis-setting of the printing wheel, since the stop bar has not been moved as far as it should have been moved. This fact necessitates that the machine be carefully serviced so as to minimize lost motion and that parts of the linkage be replaced promptly as soon as they show any appreciable wear, if mis-settings of the wheel are to be avoided. Furthermore, inasmuch as when the cage is released the printing wheel spins free under the force of the tension stored in its driving spring, there will be an appreciable hammer action between the step cam and the stop bar which may result in bouncing of the printing wheel and consequent mis-setting thereof, and furthermore imposes an excessive wear on the stop bar and step cam. In installations, such as parimutuel systems at racetracks where each ticket issued may be redeemable for a considerable sum of money, any mis-printing of tickets is apt to be expensive and should be avoided. It is to the solving of this difficulty that the present invention particularly relates.

In its preferred form, the control mechanism of the present invention utilizes an arrangement wherein the selection depends upon the position of a movable part rather than upon the distance traveled by the part as it is moved from a non-operated to an operated position. With the machine in normal adjustment, there is a certain amount of over-travel of the selecting part and as wear develops or lost motion creeps into the operating mechanism the consequent shortening of the path of travel of the selecting part is inconsequential and incapable of causing a mis-setting of the printing wheel. Furthermore, in accordance with the teachings of the present invention, the movement of the printing wheel to bring an associated stop pin into engagement with an operated stop bar under the force of the tension of the driving spring of the wheel is controlled so that there is a minimum of hammer action between the engaging stop pin and bar, and danger of bouncing of the printing wheel and excessive wearing of the stops are eliminated.

In carrying out the teachings of the invention in its preferred form, bell crank levers are pivotally mounted upon a stationary part of the machine in juxtaposition to the rotating cage so as to be rotatable around an axis that is parallel to the axis of rotation of the cage. Each of these cranks is connected by a suitable flexible link, such as a Bowden wire, to an associated key. Carried upon the cage in such position as to register with these bell cranks when the cage is in normal position are a plurality of pivoted control levers connected to respective ones of the slidable stop bars that are arranged in a circle whose center coincides to the axis of rotation of the printing wheel. An operation of the bell crank lever rotates the control lever thereby to move the stop bar longitudinally of the axis of the cage and into the path of a stop pin carried by the printing wheel. Suitable latch means holds the stop bar in this operated position. When the cage is released and moves away from its normal position, a fixed cam that is engaged by a cam roller that is connected through a suitable linkage, including a gear segment and pinion on the printing wheel, controls the movement of the printing wheel to bring stop pin carried thereby into engagement with the operated stop bar thereby to effect the setting of the printing wheel in position to print the number corresponding to the depressed key.

During the latter part of the movement of the cage, the segment is blocked and further movement of the cage causes the pinion to ride over the segment thereby to rotate the printing wheel back to its normal position in readiness for the next operation of the machine. Although the printing wheel is returned to normal, the stop bar that was moved to operated position to effect the previous selection is not returned to normal even when the associated key is restored. Rather the stop bar remains in operated position until another stop bar is moved to operated position when another key is depressed, at which time the first bar restores to normal. In case one key is operated several times in succession, the stop bar moved into operated position on the first operation will remain in that position throughout the series of transactions. This locking of the stop bar in operated position makes simpler the checking of a machine suspected of issuing wrongly numbered tickets.

The setting and restoring of the printing wheel will best be understood by referring to Fig. 8 of the drawings wherein these operations are diagrammatically illustrated.

The printing wheel 10 is mounted for rotation around an axis represented by the shaft 11 and carries a spring 12 that is tensioned to rotate the wheel in a counter-clockwise direction. A stop pin 13, fixed with respect to the wheel 10, is moved in a circular path around the axis of the wheel by a rotation of the wheel. Located upon the printing faces of the printing wheel are digits 1 to 0, inclusive. Located in juxtaposition to the path of the stop pin 13 are ten stops, indicated generally at 14, nine of which are adjustable and the tenth or zero stop 15 is fixed permanently in the path of the stop pin 13. This pin engages the fixed stop 15 to determine the normal position of the printing wheel and also to set the wheel so as to print zero.

Fixed on the wheel 10 for rotation around the axis 11 is a pinion 16 that meshes with a gear segment 17 that is mounted for rotation around an axis 18 which coincides with the axis of rotation of the cage that carries the printing indicia. Connected to the gear segment by suitable linkage 19 is a cam roller 20 which engages a cam 21 diagrammatically shown as rotatable about an axis 22, although, as will presently appear in the embodiment of the invention shown, the cam 21 is stationary. The tension of spring 12, acting through the pinion 16 and gear segment 17, urges the cam roller 20 to the right in Fig. 8. As cam 21 moves with respect to the roller in a counter-clockwise direction, as indicated by the arrow, the distance of the roller from the axis of rotation is decreased by the shape of the cam surface, and printing wheel 10 is allowed to rotate in a counter-clockwise direction under the force put upon it by the spring. This rotation continues until the stop pin 13 engages an operated stop or until it engages the fixed stop 15. The printing wheel 10 is reset to its normal position and the tension built up in spring 12 by rotation of the gear segment 17 in a counter-clockwise direction around the axis 18. For this purpose, a suitable control lever 23 engages a radial arm 24 and as the lever 23 moves to the right, as indicated by the arrow, the gear segment will be rotated and pinion 16 will rotate in a clockwise direction

thereby to move the printing wheel back to normal.

As will be seen in Figs. 1 and 2, the ticket machine to which the instant invention is adaptable consists of side frame members 1 and 2, and a front plate 3, through which a plurality of keys 4 project, these keys being mounted for limited rotation around a common axis 5. The keys are shown as being numbered from 1 to 12, inclusive, plus a thirteenth key marked "T" for "Test," this arrangement being one commonly employed in machines of the type shown in the above Black patents built for use in this country.

Within the machine is a rotatable cage 6 that carries various printing indicia 7 and adjustable printing wheels 8 and 10 for printing the tens and units digits respectively of the numbers. The cage is operated in response to the depressing of one of the keys through one cycle in a manner more fully explained in the above Black patents. It is to the control of the units wheel 10 of a machine of this type that the present invention particularly relates.

As will be seen best in Figs. 2 and 3, mounted by suitable brackets upon a cross bar 30 which extends from side plate to side plate of the machine are a plurality of bell cranks 31 pivotally mounted for rotation around an axis 32 that is parallel to the axis of rotation 18 of the cage 6. Each of the bell crank levers 31 is connected by a suitable link, such as a Bowden wire 33, to an associated key 4, so that when the key is moved to its operated position, as shown by dotted lines in Fig. 2, the bell crank will be moved in a clockwise direction to elevate the generally horizontal portion 34 of the crank.

Main shaft 35 of the machine, which is centered upon the axis of rotation 18 of the cage, carries a collar 36, Figs. 2 and 3, which supports a framework 37 that supports ten vertically disposed control levers 38, each of which registers with a horizontal portion 34 of one of the bell crank levers when the cage is in its normal position, as shown in the drawings. The frame 37 also carries a plurality of pivoted levers 39, each of which is connected to one of the control levers 38.

Projecting through suitable plates 40 carried by the cage and by the bracket members 37 thereon, are the stops 14, each of which is connected to one of the pivoted levers 39. Thus it will be seen that when a key 4 is depressed and through its associated Bowden wire 33 a bell crank lever 31 is rotated to raise its horizontal arm 34, the corresponding control lever 38 will be raised and the pivoted lever 39 rotated in a clockwise direction, Fig. 3, thereby to move the connected stop bar 14 to the right.

As will be seen best in Figs. 3 and 4, a latch 41 is pivotally mounted upon frame member 37 and extends from end-to-end of the frame engaging all of the levers 38. Each lever has an upper notch 42 into which the latch 41 projects when the lever is in its lowermost or normal position, and a notch 43 into which the latch projects when the lever is raised to its operated position. When a lever is operated, latch 41 rotates on its pivots in a clockwise direction, Fig. 4, against the tension of spring 44. Each lever 38 is urged downwardly by a spring 45, Fig. 3, and when the latch 41 is rotated by the upward movement of a lever 38, any other lever that is in an elevated position will be moved downwardly by its spring. This insures that only one lever 38 will be maintained in operated position and consequently only one stop bar 14 will be maintained in position to be engaged by the stop pin 13 on the printing wheel.

It will be noted in Figs. 2 and 4 that an arm 46 is fixed upon latch 41 and that a pin 47 is fixed in the free end of arm 46. Pivoted on the frame member 37 is a bifurcated arm 48 and the pin 47 rides in the slot in this arm. A hook 49 is formed on the end of arm 48. Mounted upon a cross bar 50 of the machine is a lever 51 having a hooklike end 52 disposed in juxtaposition to the hook 49. As the latch 41 is riding over one notch and into the adjacent notch as a lever 38 is being elevated, arm 46 will act to rotate arm 48 clockwise (Fig. 2), thereby to engage hook 49 with hook 52. When the latch drops into the lower notch 43 in the thus elevated lever 38, arm 48 is rotated in a counter-clockwise direction to disengage the hooks.

When the machine is tripped preparatory to operating the cage through one revolution to print and issue a ticket, in the manner pointed out in the Black patents, cross bar 50 is moved to the right (Fig. 2) to the position shown in dotted lines. If the operation of the latch 41 is faulty and is halted before the latch has rotated counter-clockwise into one of the notches 42 or 43, as might be the case if one of the levers 38 was but partially operated, hooks 49 and 52 will be engaged together and this movement of the bar 50 will be prevented. The machine will block and a ticket cannot be printed and issued until the trouble has been cleared to free the hooks so that bar 50 may move normally.

Fixed at the end of the printing wheel 10 is a pinion 16, Figs. 1, 3, 5 and 7, with which the gear segment 17 meshes, the gear segment being loosely mounted upon the main shaft 35 for rotation around the axis of rotation 18 of the cage.

As will be seen in Fig. 5, connected to the gear segment 17 is a link 60 which is pivotally connected to a lever arm 61 that is carried upon a shaft 62 that is journaled in the cage 6 and extends from end-to-end thereof substantially parallel to the axis of rotation 18. At the opposite end of the cage, that is the right-hand end, Fig. 3, shaft 62 carries a cam roller arm 19, Fig. 6, at the free end of which is mounted a cam roller 20 that engages a stationary cam 21 that is fixed upon a stationary member 63 of the machine. The tension of spring 12, Fig. 7, tends to rotate the printing wheel 10 counter-clockwise, and pinion 16 places a torque on gear segment 17 which is transmitted through link 60 and lever 61 to the shaft 62 and tends to rotate that shaft counter-clockwise. This torque tends to move the arm 19 and cam roller 20 counter-clockwise around the axis of shaft 62 and presses the cam roller 20 against the cam 21. The surface of the cam engaged by the roller is shaped so that as the roller 20 moves clockwise over the cam, Fig. 6, the distance of the roller from the axis of rotation 18 of the cage is decreased.

Thus it will be seen that when a key is depressed to initiate an operation of the machine, a stop bar is moved into the path of a stop pin carried by the printing wheel. When the cage starts moving clockwise, Figs. 2 and 5, the cam roller moves over a cam and permits the tension of the driving spring of the printing wheel to rotate that wheel gradually thereby to bring the stop pin into engagement with the pre-set stop bar. The manner of initiating this movement of the cage and controlling it is not of the essence of the present invention and reference is here made to the above mentioned Black patents for such operation.

The printing wheel having been set during the initial movement of the cage revolves with the cage and prints the ticket. After the printing wheel has engaged the ticket and during the last portion of the movement of the cage back to its normal position, the printing wheel is reset to its normal position and tension built up in the spring in the following manner.

Assuming that the key depressed is number 8, in which case when the stop pin has engaged the operated stop bar printing wheel 10 will be positioned with respect to the segment 17, as shown in dotted lines in Fig. 7.

A reset arm 24, which is fixed with respect to the gear segment 17 and carried by the main shaft 35 and rotatable therearound, engages a stop 23. Stop 23 is mounted on bar 50 which was moved to the right at the beginning of the operation of the cage in the manner hereinabove mentioned. During the rotation of the cage through its cycle and before arm 24 is in position to engage stop 23, bar 50 returns to its normal position and stop 23 is moved into the path of the arm. Engagement of the arm 24 with stop 23 prevents further movement of the gear segment 17 with the cage and continued movement of the cage causes the printing wheel to rotate in a clockwise direction from the dotted to the full line position, Fig. 7, thereby moving back to normal and restoring the printing wheel in readiness for the next operation. When the cage is again released to initiate another operation of the machine, stop 23 is again moved out of the path of the arm 24 so that the gear segment can rotate with the cage as the printing wheel moves in a counter-clockwise direction, as hereinabove explained.

When the cage returns to normal, as above, the machine clears itself in readiness for the next operation. The key which was depressed to initiate the operation was locked in depressed position and maintained there throughout the cycle, being released at the end of that cycle. Restoration of an operated key restores the associated bell crank lever to normal; however, the stop bar that was moved into operated position does not return to normal when the key restores. This is advantageous. Occasionally the ticket seller will depress a key other than the wanted key and the machine will issue a ticket other than the one wanted, and when this happens the ticket seller invariably blames the machine rather than himself for the error. With the stop bar last used remaining in operated position, it is a simple matter to determine where the error lies, and after the ticket seller has been shown a few times that the error is his rather than the machine's, he will be more careful and less apt to make further errors. In all prior art machines, insofar as I am aware, the selecting mechanism restored to normal fully when the machine cleared itself, and checking of an error as above was not possible.

From the foregoing it will be seen that movements of the printing wheel in and out of the normal position are controlled; that the amount of such movement depends upon the position of an operated stop bar; that the stop bar is moved from an operated to a normal position through a linkage that requires a minimum of maintenance to maintain it in condition for properly controlling the printing wheel; and that the mechanism is of simple construction capable of being manufactured at low cost without sacrificing quality and capable of being maintained operative cheaply.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a ticket printing and issuing machine in which a cage is rotated through one revolution to print a ticket for issuance and a printing wheel on said cage is rotated during the initial movement of the cage to set it to print on the ticket a number corresponding to a depressed key in the machine, a control for said printing wheel comprising: a plurality of bell cranks mounted upon a stationary part of the machine in juxtaposition to said cage; means connecting each key to a corresponding bell crank to operate the bell crank when the key is operated; a plurality of stop bars mounted upon the cage, there being a stop bar for each of the ten printing positions of the printing wheel; a control lever for each stop mounted on said cage and adapted to be operated by a corresponding bell crank in operated position; latch means for holding an operated control lever in operated position thereby to maintain the associated stop in operated position; a stop pin on the printing wheel adapted to engage an operated stop bar to position the printing wheel with a selected number in printing position; a spring tensioned to rotate the printing wheel; a pinion fixed on the printing wheel; a gear segment on the cage movable with respect thereto and engaged with said pinion; a cam roller on said cage connected to said segment; and a stationary cam engaged by said roller and shaped to permit said spring to rotate the printing wheel as the cage rotates thereby to set the wheel to print a number corresponding with an operated key in the machine.

2. In a ticket printing and issuing machine in which a cage is rotated through one revolution from and to a normal position to print and issue a ticket and a printing wheel on said cage is rotated during the initial movement of the cage to set it to print on the ticket a number corresponding to an operated key in the machine, a control for said printing wheel comprising: a bell crank for each position of the printing wheel, located on a stationary part of the machine in juxtaposition to the cage; a plurality of printing wheel stop bars mounted upon the cage, a control lever for each stop bar mounted upon the cage and registered with a corresponding bell crank when the cage is in said normal position; a link connecting each key to the corresponding bell crank and adapted to operate the crank as the key is depressed thereby to move the corresponding control lever to move the associated stop bar into position to limit movement of the printing wheel, latch means on the cage for holding said stop bar in said position; a stop pin on the printing wheel, a spring tensioned to rotate the printing wheel to move said stop pin towards said operated stop, a cam, and means moving over the cam as the cage rotates for controlling the movement of said printing wheel by said spring to move said stop

pin into engagement with the stop thereby to set the printing wheel to print the number corresponding to the key that has been operated.

3. In a ticket printing and issuing machine in which a cage is rotated from a normal position through one revolution to print and issue a ticket and in which a printing wheel on the cage is rotated with respect to the cage during the initial movement of the cage to set it to print on the ticket a number corresponding to the number of the key that has been operated to initiate an operation of the machine, a control for said printing wheel comprising: a plurality of stop bars on the cage, means actuated by the operation of a key in the machine for moving a corresponding one of said stop bars into operative position; latch means for holding the stop bar in said operative position, a stop pin on the printing wheel, a spring tensioned to rotate the printing wheel; a pinion carried on the printing wheel; a gear segment meshed with said pinion and mounted on the cage for limited rotation with respect thereto; a cam roller mounted on said cage for limited movement radially towards the axis of rotation of the cage; link means connecting said cam roller to said gear segment thereby to cause the tension in said spring to urge the roller towards the axis of rotation of the shaft; and a stationary cam over which the roller moves as the cage is rotated thereby to permit said spring to rotate the printing wheel until said stop pin engages the stop to arrest said rotation with the printing wheeel in position to print the number corresponding to the key that was operated.

4. In a ticket printing and issuing machine having a plurality of keys operable one at a time to initiate an operation of the machine and in which a cage is rotated through one revolution from a normal position for each operation of the machine to print and issue a ticket bearing the number of the operated key, means for setting a printing wheel on the cage to print the number of an operated key comprising: a plurality of levers pivotally mounted for rotation around an axis that is parallel to the axis of rotation of the shaft and is in juxtaposition to the cage, a Bowden wire connecting each key to a corresponding one of said levers and arranged to raise the lever when the key is depressed, a stop pin on the printing wheel, a plurality of stop bars on the cage, an operating lever for each stop bar registered with a corresponding one of said levers when the cage is in normal position, said operating lever being operated when the lever with which it is registered is raised to move the associated stop bar into the path of the stop pin; latch means engaging said operating lever for holding said bar in said path; and means for rotating the printing wheel to bring the stop pin into engagement with the stop bar as the cage moves out of normal position thereby to set the wheel to print the number corresponding to the operated key.

5. In a ticket printing and issuing machine in which a cage is rotated through one revolution from a normal position to print and issue a ticket bearing a number corresponding to the number of an operated key in the machine, a printing wheel pivotally mounted on said cage for rotation around an axis parallel to the axis of rotation of the cage; a spring tensioned to rotate said wheel in one direction, a stop pin fixed on said wheel, a plurality of stop bars selectively movable into the path taken by said stop pin as the wheel rotates; means responsive to an operation of a key in the machine for moving the associated stop into said path; means for holding an operated stop in operated position; a pinion on said wheel; a gear segment journaled for rotation around the axis of rotation of the cage and meshed with said pinion, a cam roller, means connecting said cam roller through said segment and pinion to said wheel thereby to cause said spring to urge said cam roller towards the axis of rotation of the cage, a cam engaged by said cam roller and shaped to permit said roller to move towards said axis of rotation during the first portion of a revolution of the cage thereby to permit said spring to rotate said wheel until said stop pin moves into engagement with said associated stop to position the wheel to print on a ticket the number corresponding to the key that is operated.

6. In a ticket printing and issuing machine in which a cage is rotated through one revolution from a normal position to print and issue a ticket bearing a number corresponding to the number of an operated key in the machine, a printing wheel pivotally mounted on said cage for rotation around an axis parallel to the axis of rotation of the cage; a spring tensioned to rotate said wheel in one direction; a stop pin fixed on said wheel; a plurality of stop bars selectively movable into the path taken by said stop pin as the wheel rotates; means responsive to an operation of a key in the machine for moving the associated stop into said path; means for holding an operated stop in operated position; a pinion on said wheel; a gear segment journaled for rotation around the axis of rotation of the cage and meshed with said pinion; a cam roller; means connecting said cam roller through said segment and pinion to said wheel thereby to cause said spring to urge said cam roller towards the axis of rotation of the cage; a cam engaged by said cam roller and shaped to permit said roller to move towards said axis of rotation during the first portion of a revolution of the cage thereby to permit said spring to rotate said wheel until said stop pin moves into engagement with said associated stop to position the wheel to print on a ticket the number corresponding to the key that is operated; an arm fixed on said gear segment and extending radially outwardly from the axis of rotation of the cage; and a stop bracket into engagement with which said arm is moved during the latter part of the rotation of the cage thereby to stop rotation of the segment so that the final movement of the cage into normal position will rotate the wheel in the opposite direction to move it into a normal position and to restore tension to said spring.

7. In a ticket printing and issuing machine in which a cage is rotated through one revolution from a normal position to print and issue a ticket and in which a printing wheel on the cage is set selectively to cause it to print on the ticket a number corresponding to an operated key in the machine, means for controlling the printing wheel to print the number of the key comprising: a bell crank mounted on a stationary part of the machine for movement around an axis that is parallel to the axis of rotation of the cage, said bell crank having an arm normally in a horizontal position; link means connecting said bell crank to said key and operable to raise said arm from said horizontal position when said key is depressed; a stop pin on the printing wheel; a stop bar on the cage; a lever operable to move said

stop bar into the path of said stop pin, said lever registering with said bell crank arm when the cage is in a normal position and being operated to move the stop bar into said path as the bell crankarm is raised from said horizontal position; a latch for holding said lever in operated position; a spring tensioned to rotate the printing wheel to bring said stop pin into engagement with the operated stop bar; and means including a cam for holding said wheel against rotation when the cage is in normal position and for controlling the rotation of the wheel as the cage moves out of normal position.

8. In a ticket printing and issuing machine in which a cage is rotated through one revolution from a normal position to print and issue a ticket and in which a printing wheel on the cage is set selectively to cause it to print on the ticket a number corresponding to an operated key in the machine, means for controlling the printing wheel to print the number of the key comprising: a bell crank mounted on a stationary part of the machine for movement around an axis that is parallel to the axis of rotation of the cage, said bell crank having an arm normally in a horizontal position; a Bowden wire link connecting said bell crank to said key and operable to raise said arm from said horizontal position when said key is depressed; a stop pin on the printing wheel; a stop on the cage; a lever operable to move said stop into the path of said stop pin, said lever registering with said bell crank arm when the cage is in a normal position and being operated to move the stop into said path as the bell crank arm is raised from said horizontal position; a latch for holding said lever in operated position; a spring tensioned to rotate the printing wheel to bring said stop pin into engagement with the operated stop; and means including a cam for holding said wheel against rotation when the cage is in normal position and for controlling the rotation of the wheel as the cage moves out of normal position.

9. In a ticket printing and issuing machine having a plurality of keys operable one at a time to initiate an operation of the machine and in which a cage is rotated through one revolution from a normal position for each operation of the machine to print and issue a ticket bearing the number of the operated key; a printing wheel mounted on the cage for rotation around an axis that is parallel to the axis of rotation of the cage; a spring within the wheel tensioned to rotate the wheel in one direction; a stop pin fixed to the wheel; a plurality of adjustable stop bars, mounted on said cage, one for each number the printing wheel is adapted to print, located on a circle that is centered on the axis of rotation of the wheel; means responsive to an operation of a key for moving a corresponding one of said stop bars longitudinally of the axis of rotation of the printing wheel into the path of said stop pin; and means including a cam for controlling the rotation of said printing wheel and consequent movement of said stop pin into engagement with the operated stop bar during rotation of the cage away from said normal position thereby to set the machine to print a ticket bearing a number corresponding to the number of the operated key.

10. In a ticket printing and issuing machine having a plurality of keys operable one at a time to initiate an operation of the machine and in which a cage is rotated through one revolution from a normal position for each operation of the machine to print and issue a ticket bearing the number of the operated key; a printing wheel mounted on the cage for rotation around an axis that is parallel to the axis of rotation of the cage; a spring within the wheel tensioned to rotate the wheel in one direction; a stop pin fixed to the wheel; a plurality of slidable stop bars mounted on said cage, one for each number on the wheel, located on a circle that is centered on the axis of rotation of the wheel and spaced on that circle so that when said stop pin engages one of the stop bars the corresponding number on the wheel will be in printing position; means responsive to an operation of a key for moving a corresponding one of said stop bars longitudinally of the axis of rotation of the printing wheel into the path of said stop pin; and means including a cam for controlling the rotation of said printing wheel and consequent movement of said stop pin into engagement with the operated stop bar during rotation of the cage away from said normal position thereby to set the machine to print a ticket bearing a number corresponding to the number of the operated key.

11. In a ticket printing and issuing machine having a plurality of keys operable one at a time to initiate an operation of the machine and in which a cage is rotated through one revolution from a normal position for each operation of the machine to print and issue a ticket bearing the number of the operated key; a printing wheel mounted on the cage for rotation around an axis that is parallel to the axis of rotation of the cage; a spring within the wheel tensioned to rotate the wheel in one direction; a stop pin fixed to the wheel; a plurality of slidable stop bars mounted on said cage, one for each number on the wheel, located on a circle that is centered on the axis of rotation of the wheel and spaced on that circle so that when said stop pin engages one of the stop bars the corresponding number on the wheel will be in printing position; means responsive to an operation of a key for moving a corresponding one of said stop bars longitudinally of the axis of rotation of the printing wheel into the path of said stop pin; a pinion fixed on said wheel; a gear segment meshed with said pinion; a cam fixed upon a stationary part of the machine; and means engaging said cam and connected to said segment for controlling rotation of the wheel to bring said stop pin into engagement with said operated stop bar as the cage rotates away from said normal position thereby to set the machine to print a ticket bearing a number corresponding to the number of the operated key.

JOHN R. MONTGOMERY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,506,382	Pierce	Aug. 26, 1924
1,886,626	Black	Nov. 8, 1932
2,111,122	Mills et al.	Mar. 15, 1938

A532

March 5, 1957 J. R. MONTGOMERY 2,783,706

ANTI-JUMPER FOR TICKET PRINTING AND ISSUING MACHINE

Filed June 25, 1953 2 Sheets-Sheet 1

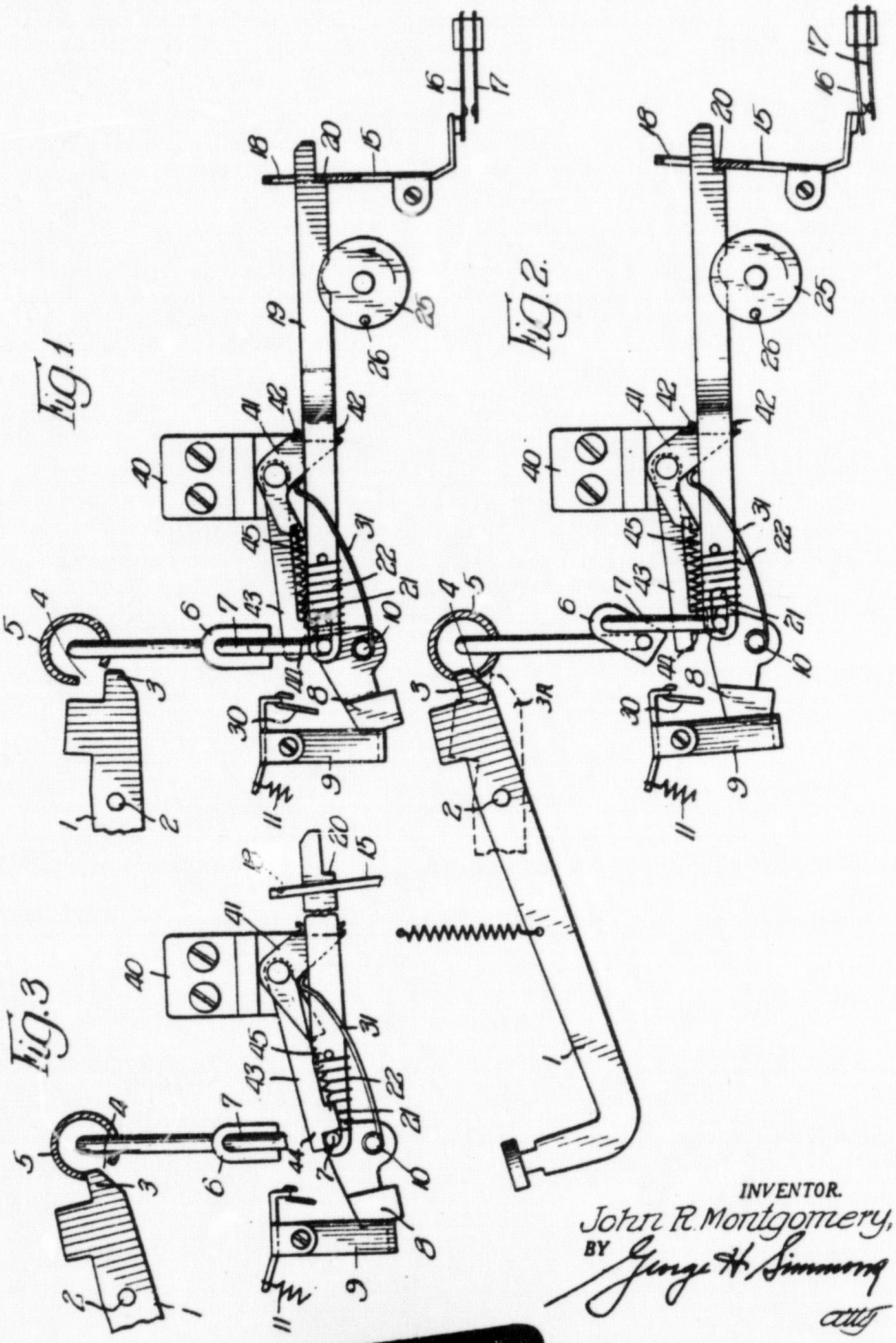


Fig. 1

Fig. 2

Fig. 3

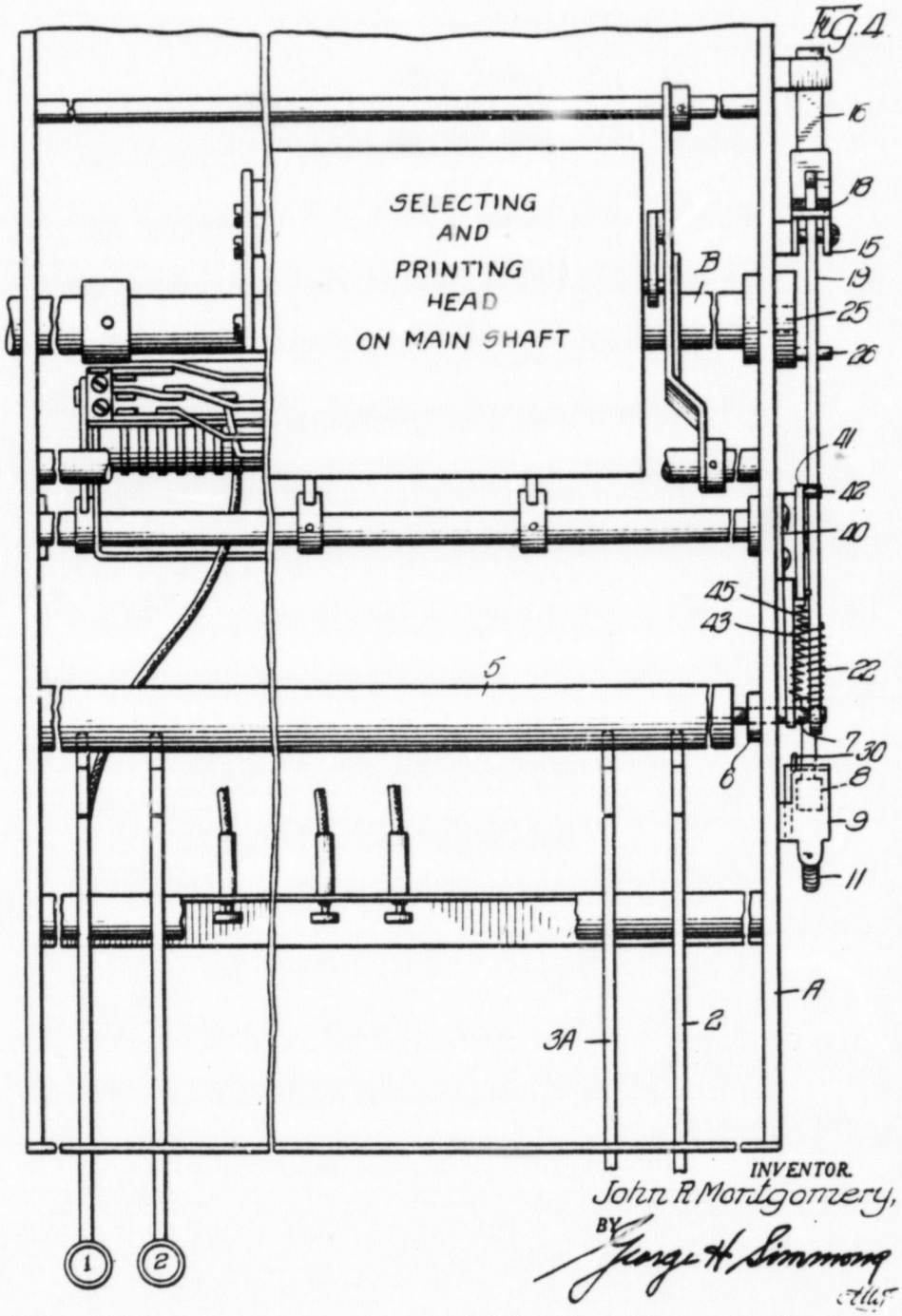
INVENTOR.
John R. Montgomery,
BY George H. Simmons
atty

March 5, 1957 J. R. MONTGOMERY 2,783,706

ANTI-JUMPER FOR TICKET PRINTING AND ISSUING MACHINE

Filed June 25, 1953 2 Sheets-Sheet 2

Fig. 4



INVENTOR.
John R Montgomery,
BY
George H. Simmons
Atty

A534

United States Patent Office

2,783,706

Patented Mar. 5, 1957

2,783,706

ANTI-JUMPER FOR TICKET PRINTING AND ISSUING MACHINE

John R. Montgomery, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application June 25, 1953, Serial No. 367,165

6 Claims. (Cl. 101—66)

This invention relates to machines for selectively printing and issuing tickets, and has for its principal object the provision of a new and improved machine of this type.

It is a main object of the invention to provide in a machine for selectively printing and issuing tickets, mechanism for preventing the initiation of a new cycle of operation of the machine before the machine has completely restored to normal from a previous operation.

Another object of the invention is to provide in a ticket machine a mechanism for preventing locking in depressed position a selection key before the machine has restored to normal from a previous cycle of operation.

Another object of the invention is to provide in a ticket printing and issuing machine mechanism for preventing initiation of a new cycle of operation of the machine before complete restoration from a previous cycle, which mechanism can be installed and maintained in proper operating condition economically.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which

Fig. 1 is a fragmentary view of that part of a ticket machine employed in initiating a cycle of operation of the machine with the mechanism in normal position;

Fig. 2 is a view similar to Fig. 1, with the mechanism in fully operated position;

Fig. 3 is a fragmentary view illustrating the invention; and

Fig. 4 is a fragmentary plan view of a ticket machine showing the application of the devices of the present invention thereto.

Machines for selectively printing and issuing tickets of the type shown in Patent 1,886,626, issued to H. D. Black on November 8, 1932, contains a plurality of keys, and responsive to the depressing of one of these keys it is locked in depressed position and a cycle of operation of the machine initiated to cause it to cut a length of ticket stock from a web and to print upon that length desired indicia, including a number corresponding to the depressed key. Customers for the tickets frequently purchase a plurality of tickets containing the same number and oftentimes the ticket seller, in effort to make haste, depresses the desired key to initiate a repeat operation of the machine before the key has completely restored to normal, with the result that the key is locked in depressed position, but a new cycle of operation of the machine is not initiated since the mechanisms of the machine were not in normal position when the key was depressed. It is then necessary that the machine be unlocked and the depressed key released to restore the machine completely to normal before a new cycle of operation can be initiated. Thus it will be seen that the efforts of the ticket seller to speed up the issuance of the ticket beats the key and results in a slowing down of that operation to the great annoyance of both the ticket seller and the customer.

The present invention provides a mechanism for preventing depressing a key far enough to cause it to be locked in depressed condition prior to the complete restoration of the machine from a previous cycle of operation. With the mechanism included in the machine, should the ticket seller attempt to speed up the issuance of tickets by depressing a selecting key before that key and the machine have completely restored to normal, he will be unable to depress the key far enough to cause it to be locked in depressed condition, and since nothing will happen he will release the key, permitting it to completely restore and thereby condition the machine for the initiation of a new cycle of operation.

The invention will be best understood by reference to the accompanying drawings wherein 1 illustrates one of the selecting keys of the machine, which is pivoted for rotation around an axis 2 and contains a projection 3 that extends into a slot 4 in a key tube 5 that is journaled in the machine for rotation around its axis. The key tube 5 extends from side plate to side plate of the machine and contains a slot, such as 4, for each of the several keys of the machine. Mounted upon the key tube 5 is a block 6 from which a pin 7 projects through a suitable opening in the side plate of the machine. As the key is depressed, the tube 5 is rotated from the position in which it is shown in Fig. 1, to the position shown in Fig. 2, pin 7 moving to the right during this rotation of the tube.

Mounted upon the side plate A of the machine, Fig. 4, is a lever 8 and a stirrup latch 9 which bears against the end of the lever when the mechanism is in normal position. Pin 7 engages the lever 8, and movement of the pin 7 rotates the lever 8 around the axis 10 upon which the lever is pivoted. The end of the lever 8 is elevated and stirrup latch 9, pressed by suitable spring means 11, moves under lever 8 thereby to lock the lever in rotated position, and through the pin 7 and tube 5 to lock the key in depressed condition. It will be noted that with the key depressed, the lower edge of the slot 4 moves into close proximity to the under edge of the projection 3, thereby preventing return to normal of the key 1. With the tube rotated into the position shown in Fig. 2, this lower edge of the slot 4 moves into the path of the projection 3A of the other keys, thereby preventing operation of any other key so long as one key is in depressed position. The keys control the selecting mechanism by which the number to be printed on the ticket is determined, in the manner that will be best understood from the above Black patent or from my prior Patent No. 2,594,787, issued April 29, 1952.

When the ticket machine is used in conjunction with a totalisator system in which the issuance of a ticket is registered, the actual operation of the machine is initiated electrically after the registration is made. The totalisator transmits an electrical impulse to the machine to start the cycle of operation. In such an installation there is mounted upon the side plate of the machine a start lever 15 which bears against a main spring 16 so that movement of the lever will move that spring into engagement with a companion spring 17, thereby to close an electrical circuit, not shown, over which the registration of the issuance of the ticket is effected and the cycle of operation is initiated.

Start switch lever 15 contains a slot 18 through which a bar 19 is projected. The bar 19 contains a shoulder 20, best seen in Fig. 3, which registers with the start switch lever 15. The opposite end of the bar 19 contains an elongated slot 21 through which the pin 7 is projected. A spring 22 encircling the bar 19 bears against the pin 7. As the pin 7 moves from the position shown in Fig. 1, to the position shown in Fig. 2, spring 22 is compressed, and after the movement of the pin 7 has progressed far enough to permit the stirrup latch 9 to fall under the

operated. As explained in the foregoing patents. position.

lever 8, the tension compressed into spring 22 will be sufficient to overcome the tension of main spring 16 and bar 19 will be moved to the right to close spring 16 against spring 17 thereby to initiate a cycle of operation of the machine.

The main shaft B of the machine carries a cam 25 which makes one complete revolution in the direction of the arrow for each cycle of operation of the machine. Cam 25 carries a pin 26 which moves into engagement with the bar 19 near the end of the cycle, elevating that bar and thereby moving the shoulder 20 out of engagement with the start lever 15 to permit the tension of spring 16 to restore the lever 15 to the normal position in which it is shown in Figs. 1 and 3. The bar 19 then extends past the lever 15 and is held in elevated position by the engagement of that lever with the bottom edge of the bar.

When the cycle of operation of the machine is being completed, stirrup latch 9 is operated through link 30 by a cam, not shown, moving in unison with cam 25, to rotate it against the tension of spring 11 and thereby out of engagement with the lever 8 to permit the pin 7, key tube 5 and key 1 to restore to normal. Pin 7 engages the end of slot 21 to pull the bar 19 to the left and spring 31 moves the bar downwardly when the shoulder 20 has moved past the lever 15.

With the mechanism as thus far described, should the ticket seller again depress key 1 before it has restored to normal, bar 19 will be in elevated position and when moved to the right by the further depressing of the key will slide through the lever 15 and the key will be locked in depressed position without operating spring 16 against its companion spring 17 to initiate a new cycle of operation of the machine. The ticket seller will be helpless to remedy the situation and the machine will remain locked up until it is opened and the mechanism restored to normal manually.

To prevent such a contingency is the main purpose of the present invention. In its preferred form, the mechanism consists of a bracket 40 mounted upon the side plate of the machine and carrying a yoke 41 pivoted thereon and having arms 42 engaging the upper and lower surfaces of the bar 19 in such a manner as to permit free longitudinal movement of the bar and to cause elevation of the bar to rotate the yoke 41 around its pivot. Also pivoted upon the bracket 40 is a latch 43 which contains a shoulder 44. The opposite end of the yoke 41 extends under the latch 43 to hold it in elevated position out of engagement with the pin 7 so long as the bar 19 is in its lowermost position. A spring 45, fixed to the latch 43 and yoke 41, is tensioned by the yoke during rotation of the yoke.

When the bar 19 is elevated, yoke 41 is rotated thereby lowering latch 43 into engagement with the pin 7. As the pin 7 moves towards its normal position after the stirrup latch 9 has been released from the lever 8, shoulder 44 is moved downwardly behind the pin 7 by the tension built up in spring 45 by the rotation of the yoke. The shoulder 44 is located so as to limit movement of the pin to the right, as shown in the drawings, at such a point that upward movement of the lever 8 is arrested before its bottom edge has moved past the stirrup latch 9, as shown in Fig. 3. So long as the bar 19 remains in elevated position, as it will until pin 7 has moved completely into its normal position, it will be impossible for the ticket seller to depress a key far enough to lock it in depressed position. Noting the blocked condition of the key, he will remove pressure from it, whereupon the key will completely restore to normal, bar 19 will move back into its lowermost position, and yoke 41 will be rotated in a reverse direction to elevate the latch 43 and shoulder 44 out of engagement with the pin. The machine now being completely restored to normal, the key may be depressed and a new cycle of operation initiated in the hereinabove explained manner.

The mechanism by which the key is latched to prevent false operation of the machine is simple and may be economically installed and maintained in proper working condition. False operation of the machine is definitely prevented and the sale of a plurality of tickets bearing the same number, to a single customer, is effected at the maximum speed of the machine.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a ticket machine for selectively printing and issuing tickets responsive to the depressing of a key which is locked in depressed position during the cycle of operation of the machine and restored to its normal position at the end of that cycle; a mechanism for preventing the initiation of a new cycle of operation of the machine until the key depressed to initiate a previous cycle has been completely restored to its normal position, comprising: a pin, means responsive to the depressing of a key for moving said pin from its normal to its operated position; a longitudinally movable bar having a slot through which said pin projects, a start switch lever engaged by said bar, means coupling said pin to said bar to cause movement of the pin into operated position to move the bar longitudinally thereby to operate said start switch lever to initiate a cycle of operation of the machine; cam means for elevating said bar during the cycle of operation of the machine; means for holding the bar in elevated position to the end of the cycle and restoration of said pin to its normal position; a latch lowered into engagement with said pin by the elevation of said bar; and a spring for moving said latch into the path of said pin to prevent movement of the pin into its operated position prior to its return to its normal position and consequent lowering of the bar.

2. A mechanism as claimed in claim 1, in which the bar extends through a slot in the start switch lever and has a shoulder that engages the start lever to move it from normal to operated position as the bar moves longitudinally and in which the shoulder is disengaged from the start lever by the upward movement of the bar, spring means for restoring the start switch lever to its normal position thereby to hold the bar in elevated position until the pin reaches its normal position.

3. A mechanism as claimed in claim 1, in which a pivotally mounted yoke engages the bar and engages the latch to hold the latch out of engagement with the pin which yoke is rotated by the upward movement of the bar to lower the latch into engagement with the pin and to tension the spring by which the latch is pressed into the path of the pin.

4. A mechanism as claimed in claim 1, in which there is a pivoted lever that is rotated upwardly by movement of the pin to operated position; a stirrup latch past which the lever is thus rotated; and a spring for moving the latch under the lever to hold the key depressed; and in which the latch blocks the movement of the pin towards operated position before the lever has moved far enough to permit the stirrup latch to swing under the lever, thereby to prevent locking of a key depressed before the bar has descended from its elevated position.

5. In a ticket printing and issuing machine, a mechanism for preventing locking or selecting key in operated position to initiate a cycle of operation of the machine prior to the complete restoration to normal of the machine and key by which a preceding cycle of operation is initiated, comprising: a pin moved by the depressing of a selecting key; a pivoted lever engaged by said pin and

raised by the movement thereof; a stirrup latch movable under the lever in raised position thereby to hold the lever in that position and the key in depressed position; a start switch lever having a slot at one end; a bar extending through said slot; a shoulder on the under side of said bar engaging said switch lever, said bar containing a slot through which said pin projects; a spring encircling said bar and against which the pin bears, said pin on moving responsive to the depressing of a key compressing said spring to move the bar longitudinally and operate said start switch lever after said stirrup latch has moved under said lever; means for elevating said bar during the cycle of operation of the machine to disengage said shoulder from the switch lever thereby to permit the lever to return to its normal position; a pivoted yoke engaging said bar and rotated thereby as the bar is elevated; a latch lowered into engagement with the pin by the rotation of the yoke; a spring extended between the latch and yoke and tensioned by the rotation of the yoke to move the latch into the path of the pin, said latch when in the path of the pin preventing sufficient movement of the pin to permit the stirrup latch moving under the lever so long as the bar remains in elevated position.

6. A mechanism for preventing locked in operated position a selecting key of a ticket printing and issuing machine prior to the complete restoration of the machine to normal from a previous cycle of operation of the machine, comprising: a key tube rotated around its axis by an operation of a selecting key; a pin carried by said tube; a crank arm engaged by the pin and rotated thereby as the tube rotates; a latch stirrup engaging said arm and movable into the return path of the arm when the key is in operated position; a starting switch; a start bar moved longitudinally by said pin to operate said switch to initiate a cycle of operation of the machine; means for elevating said start bar out of engagement with said switch during the cycle of operation of the machine; a pivoted arm rotated by the upward movement of said start bar; a latch moved into the path of said pin by said rotation of said pivoted arm, said latch preventing movement of the pin far enough to permit the latch stirrup to lock the selecting key in operated position so long as said start bar remains in elevated position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,886,626	Black	Nov. 8, 1932
1,966,657	Von Pein	July 7, 1934
1,983,247	Saxby	Dec. 4, 1934
1,992,767	Pierson	Feb. 26, 1935
2,097,485	Helsel	Nov. 2, 1937
2,269,644	Bratt	Jan. 13, 1942
2,344,377	Vigborg	Mar. 14, 1944
2,594,787	Montgomery	Apr. 29, 1952

March 5, 1957 J. R. MONTGOMERY 2,783,707

ANTI-JAMMER FOR TICKET PRINTING AND ISSUING MACHINE

Filed June 25, 1953 2 Sheets-Sheet 1

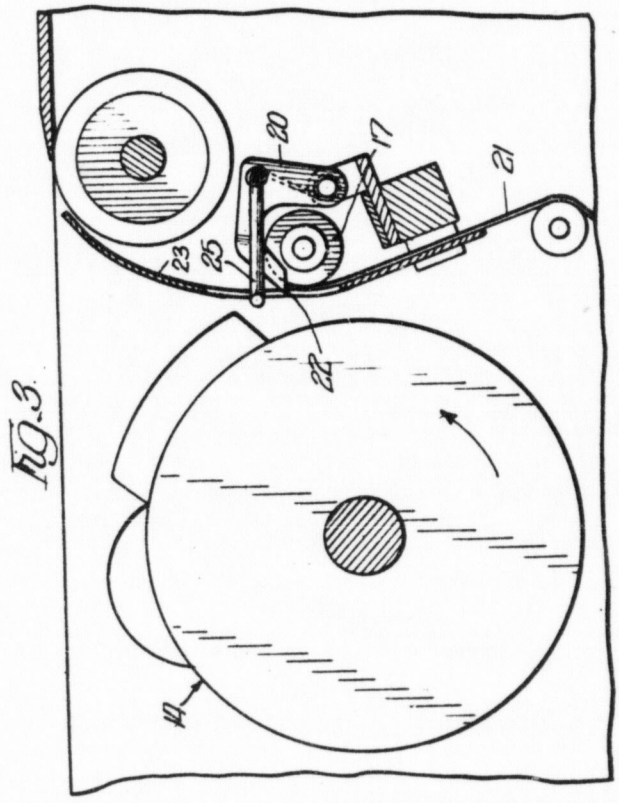


Fig. 3.

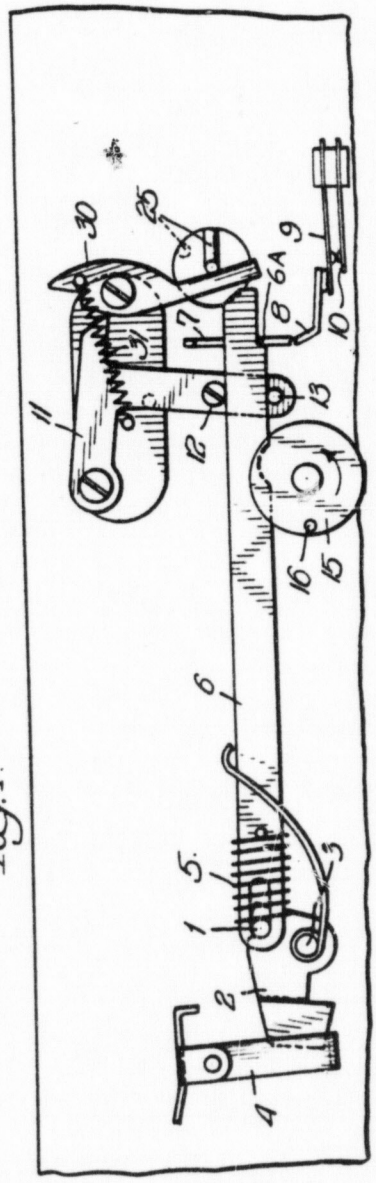


Fig. 1.

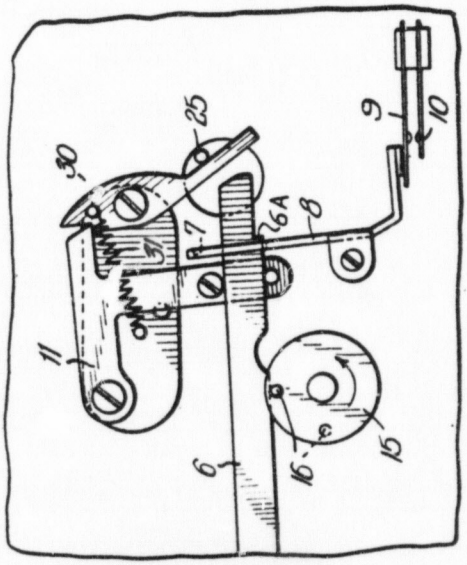


Fig. 2

INVENTOR.
John R. Montgomery,
BY George H. Simmons
Atty.

A538

March 5, 1957 J. R. MONTGOMERY 2,783,707

ANTI-JAMMER FOR TICKET PRINTING AND ISSUING MACHINE

Filed June 25, 1953 2 Sheets-Sheet 2

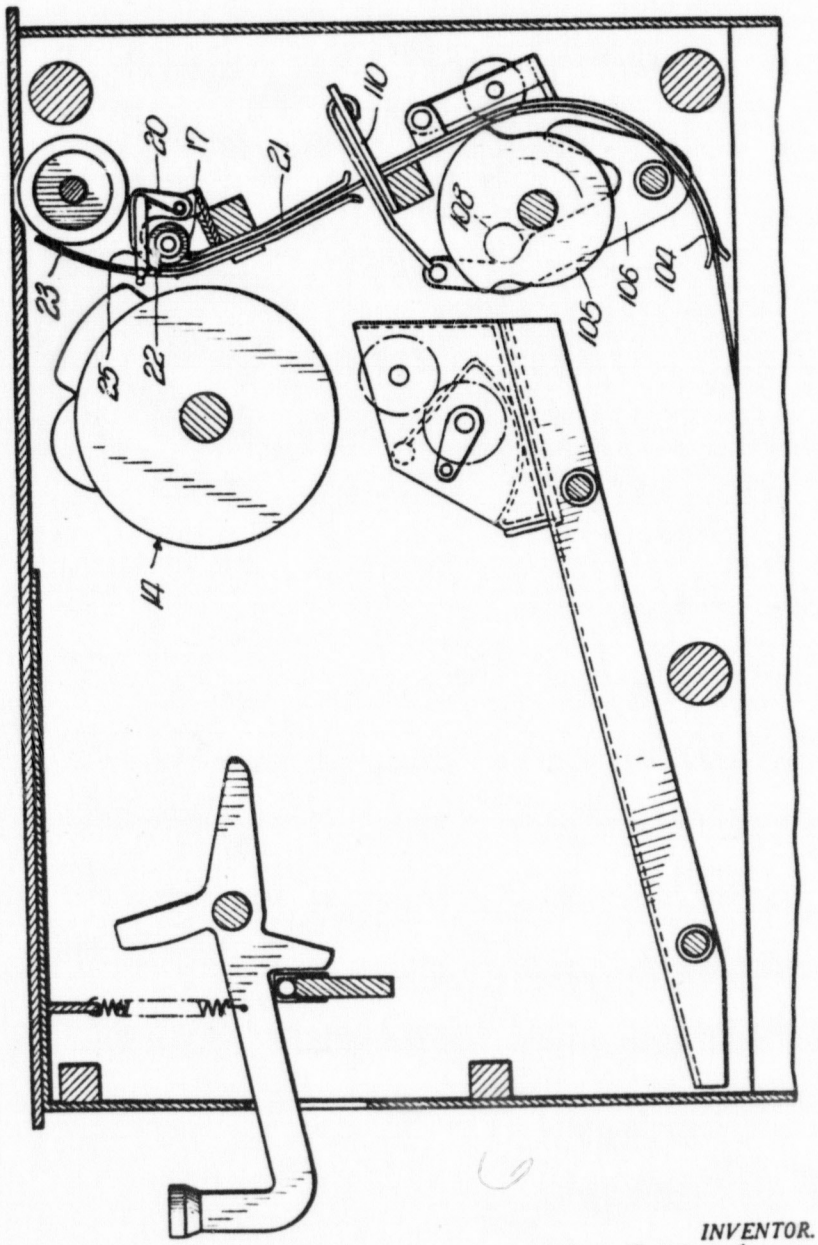


Fig 4

INVENTOR.
John R. Montgomery,
BY
George H. Simmons
Atty

United States Patent Office

2,783,707

Patented Mar. 5, 1957

2,783,707

ANTI-JAMMER FOR TICKET PRINTING AND ISSUING MACHINE

John R. Montgomery, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application June 25, 1953, Serial No. 364,137

7 Claims. (Cl. 101—66)

This invention relates to machines for selectively printing and issuing tickets, and has for its principal object the provision of a new and improved machine of this type.

It is a main object of the invention to provide in a machine for selectively printing and issuing tickets, mechanism for preventing the jamming of a plurality of tickets in the delivery chute of the machine.

Another object of the invention is to provide in a machine for printing and issuing tickets, a mechanism for preventing the initiation of a new cycle of operation of the machine until a ticket printed in the preceding cycle has moved in the delivery chute past the point at which jamming of a plurality of tickets in the chute may possibly occur.

Another object of the invention is to provide an anti-jamming device which is simple to install and maintain in proper working condition.

Further objects of the invention not specifically mentioned here will be apparent from the description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which

Fig. 1 is a fragmentary view of a ticket machine showing the anti-jamming device in normal position;

Fig. 2 is a fragmentary view similar to Fig. 1, showing the device in operated position;

Fig. 3 is a fragmentary view of the machine showing the control of the anti-jamming device; and

Fig. 4 is a partial view of a ticket machine with the casing in cross section and showing the environment of the invention.

Machines for severing a ticket from a roll of stock, then selectively printing and issuing the ticket of the type shown in Patent No. 1,886,626, issued to H. D. Black on November 8, 1932, are provided with a delivery chute into which the ticket is moved after engaging the printing mechanism which impresses the desired indicia upon it. In the printing chute the ticket is moved along by a roller to a final position where it projects out of the machine so as to be available to the customer purchasing it.

It frequently happens that customers purchase a plurality of tickets and oftentimes hold their hand over the delivery opening of the machine or chute, thus interfering with the intended movement of the tickets therethrough, with the result that a plurality of tickes will be jammed in the machine, if it is possible to re-operate the machine before a preceding ticket has passed the point where jamming is possible.

Ticket machines of this type are provided with a lever which engages the leading edge of a web of paper from which the tickets are cut, when that web is properly threaded into the machine in readiness for an operation of the machine. Should the supply of paper become exhausted, this lever moves to a lowered position in which mechanisms controlled by it prevent an operation of the machine in the manner fully explained in the above mentioned Black patent.

In Fig. 4 I have shown a portion of a ticket machine of the type shown in Black 1,886,626 to show the environment in which the present invention is used. From this figure it will be apparent that the web of ticket stock in guide **104** is advanced by cam roller **105**, a distance equal to a ticket, and as **105** finishes advancing the stock, a pin **108** thereon engages a lever **106** through which a knife **110** is operated to sever a ticket from the leading portion **21** of the web. The leading edge of the ticket so severed from the web is in engagement with the platen and ticket lever of the machine when the knife **110** is operated.

The present invention utilizes this lever, which is moved out of its normal position in a reverse direction by a ticket in the delivery chute, to prevent the initiation of a new cycle of operation until the ticket has passed the point of jamming in the chute.

When a plurality of tickets are jammed in the delivery chute, the machine must be opened and the tickets removed from the chute. This operation is comparatively simple if there is but a single ticket in the chute; however, when a plurality of tickets are so jammed together, these tickets are badly mutilated during the process of removing them from the chute. Furthermore, since the jamming of the tickets occurs almost immediately after the printing operation, the ink is not dry and will be smeared—oftentimes so badly smeared that it is difficult to determine the number printed upon the ticket. The jammed tickets obstruct the leading edge of the oncoming paper and that paper becomes wadded in the printing mechanism and is printed imperfectly, if at all. Since duplicate tickets must be issued to replace those jammed in the machine, such smearing, imperfect printing and mutilation of the tickets is a further definite disadvantage. The present invention eliminates both the delay factor and the mutilation of the tickets.

The invention will be best understood by reference to the accompanying drawings. Ticket machines of this type are provided with a plurality of keys, Fig. 4, one of which is depressed to determine the number to be printed upon the ticket and to initiate the cycle of operation of the machine. The depressing of such a key moves a pin **1** to the right, as seen in Fig. 1, and with it rotates lever **2** around its pivot **3** to permit stirrup latch **4** to pass under the lower edge of the lever **2** and thereby lock the key in depressed position.

Movement of the lever **1** compresses a spring **5** that surrounds a start bar **6** which, at its opposite end, extends through a slot **7** in a start switch lever **8**, shoulder **6a** on bar **6** engaging the lever **8** at the bottom of slot **7**, as shown in Fig. 1. After pin **1** has moved far enough to lock the key in depressed position, the force of spring **5** overcomes the tension of main spring **9** and the start lever **8** is moved clockwise by the longitudinal movement of the bar **6** to move main spring **9** into engagement with its companion spring **10** and thereby close an electrical circuit, not shown, over which the cycle of operation of the machine is initiated.

Mounted upon the side frame of the machine is a generally T-shaped latch **11**, one arm of which carries projections **12** and **13** disposed against the upper and lower edges of the bar **6**, the bar being capable of sliding longitudinally between these members.

The cycle of operation of the machine thus initiated causes the printing mechanism **14** to be rotated in the direction indicated by the arrow and mounted upon the same shaft as the printing mechanism is a cam **15** which carries a pin **16** that engages the bar **6** and elevates that bar in preparation to terminating the cycle of operation. Shoulder **6a** is thus disengaged from the lever **8**, as shown in Fig. 2.

Mounted adjacent the printing platen **17** of the machine is a lever **20** which, when the web of paper **21**

is properly positioned in readiness for a printing operation, rests against the leading edge 22 of that web and is positiond as shown in Fig. 3. As the printing mechanism moves and the web of paper is moved upwardly, lever 20 is rotated in a clockwise direction and held by its engagement with the ticket in the delivery chute 23. During the cycle of operation of the printing mechanism, the web is cut to form a ticket in the manner fully explained in the above mentioned Black patent and the new leading edge of the web is moved into the position in which the web is shown in Fig. 3.

Mounted upon lever 20 is a rod 25 which extends through the side plate of the machine and is located in the position shown in full lines in Fig. 1 when the cam is in the position shown in Fig. 3. As soon as the ticket being printed moves the lever 20 in a clockwise direction, rod 25 moves into the position shown in dotted lines in Fig. 1 and in full lines in Fig. 2. Rod 25 remains in this position until the trailing end of the ticket has passed beyond the lever 20.

Elevation of the rod 6 by the pin 16 into the position shown in Fig. 2, rotates the latch lever 11 around its pivot in a counter-clockwise direction, bringing the projecting end of the latch beyond the notch in the pawl 30, and spring 31 rotates the pawl around its pivotal mounting thereby latching the bar 6 in elevated position, even though pin 16 moves out of engagement with the bar and comes to rest in the position shown in dotted lines in Fig. 2. It will be noted that the elevation of the bar causes the tension of spring 9 to rotate the start lever 8 in a counter-clockwise direction, the spring moving away from its companion spring 10, thereby to open the circuit over which the cycle of operation of the machine was initiated.

At the completion of the cycle, stirrup latch 4 restores, permitting the key to restore to normal and pin 1 moves to the left, taking with it bar 6 which in normal operation of the machine drops back into its lowermost position to re-engage shoulder 6a with the start lever 8 in readiness to initiate a new cycle of operation of the machine.

So long as the ticket remains in the delivery chute and lever 20 holds rod 25 in elevated position, latch 11 holds bar 6 in elevated position. Should a key be re-operated, it will be locked in depressed position, bar 6 will move to the right as before, however start lever 8 will not be operated, and a new cycle of operation will not be initiated. The jammed ticket must be removed from the delivery chute, and since there is but a single ticket in the chute this ordinarily can be done without difficulty and the ticket will not be smeared or mutilated, or the feed of the oncoming paper interfered with. As soon as the ticket is moved past the lever 20, rod 25 restores to its normal position and through its engagement with the projecting lever of pawl 30 rotates that pawl, thereby to permit the latch 11 to restore and drop the bar 6 into its normal position. The locked-down key is then released manually, thereby to move bar 6 to the left into engagement with the start lever 8 in readiness for the initiation of a new cycle of operation of the machine.

When the ticket passes through the delivery chute in the normal manner, rod 25 will restore before the end of the cycle of operation of the machine, latch 11 will restore dropping the bar 6 to its lowermost position so that when it is moved to the left as the depresesd key is restored it will re-engage the start lever 8 in a normal manner.

From the foregoing it will be seen that by latching the bar 6 in elevated position during each cycle of operation of the machine, and maintaining it so elevated until the ticket has passed the danger point in the delivery chute, jamming of a plurality of tickets in the chute is definitely prevented.

When the anti-jamming device of the present invention is used in conjunction with the device shown in my copending application (Case 2568), Serial No. 364,165, filed June 25, 1953, the keys of the machine cannot be depressed to initiate a new cycle of operation of the machine until the bar 6 has been returned to its lowermost position. Thus, if a single ticket is jammed in the chute, no re-operation of the machine is possible, and, as frequently happens, such a ticket can be removed from the chute without jamming the machine and the ticket seller or customer can oftentimes clear the machine without aid. This is particularly true when the jamming is caused by the customer attempting to hold a plurality of tickets in the chute so that he may take them all at one time.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to protect by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a machine for printing and issuing selectively numbered tickets in which a plurality of keys are depressable one at a time to select the number to be printed on the ticket and to initiate an operation of the machine to sever a ticket from a web of stock and print and deliver the same; a device for preventing jamming of tickets in the chute through which the tickets are delivered, comprising: a pivoted lever raised to operated position by a ticket in said chute, a rod fixed on said lever and raised out of normal position by movement of the lever to its operated position; a start switch; a start lever for operating said switch to close an electrical circuit to initiate an operation of the machine; a pin moved as a key is depressed; a start bar; means connecting said pin to said start bar to cause movement of the pin to move the start bar longitudinally thereby to operate the start lever to operate the switch; a cam rotated during an operation of the machine, means on said cam engageable with said start bar during rotation of the cam thereby to elevate said start bar out of engagement with said start switch lever; a latch; means connecting said latch to said start bar whereby elevation of the start bar moves the latch to operated position; a pivoted pawl having a lever extending into engagement with the rod that is fixed upon the ticket engaging lever; spring means for moving said pawl into engagement with the latch to hold the latch in operated position and the start bar elevated; means for lowering said ticket engaging lever as a ticket is moved out of engagement therewith, thereby to cause the rod fixed thereon to move the pawl out of engagement with the latch to permit the latch and start bar to restore to normal, and means for restoring said start bar and latch to normal in readiness for another operation of the machine.

2. A machine as claimed in claim 1, in which the starting lever contains a perforation through which the start bar slides freely when in elevated position and in which the start bar contains a shoulder that engages the starting lever when the bar is in lowered position to operate the start lever.

3. A machine as claimed in claim 1, in which the means connecting the latch to the start bar includes spaced apart pins carried on the latch and disposed above and below the start bar between which pins the bar slides longitudinally and through which pins the bar raises the latch and the latch holds the bar elevated.

4. A mechanism for preventing the jamming of a plurality of tickets in the delivery chute of a ticket printing and issuing machine, comprising a start switch lever operable to close an electrical circuit over which the machine is operated through a cycle to print and issue a ticket; a start bar movable longitudinally to operate said switch to initiate said cycle; a cam operable during said cycle to raise said start bar out of engagement with said switch to restore the switch to normal; a latch engaging said start bar and rotated into operated position by the upward movement of said start bar; a pawl for holding said latch

in operated position thereby to hold said start bar out of engagement with said switch to prevent a reoperation of the switch; a lever moved to operated position by a ticket in the chute and maintained in operated position so long as the ticket remains in the chute; a rod fixed upon and actuated by said ticket chute lever; and a lever on said pawl through which the pawl is moved out of engagement with said latch by said rod as the chute lever restores to normal after the ticket is removed from the chute thereby releasing the latch; and means for lowering the start bar to re-engage the switch lever in readiness to initiate another cycle of operation of the machine.

5. The combination with a ticket printing and issuing machine in which a selected key is depressed to move a start bar longitudinally thereby to operate a start switch lever to initiate a cycle of operation of the machine to sever a ticket from a roll of stock, print and deliver the same; of an anti-jamming device for preventing the jamming of a plurality of tickets in the delivery chute of the machine, comprising: a pivoted lever rotated from a normal to an operated position by a ticket being delivered by the machine; means for raising the start bar out of engagement with the start switch lever when the cycle of the machine is partially complete; a pivoted latch; means connecting said latch to said start bar to cause the latch to be raised as the start bar is raised; a pivoted pawl; means for moving said pawl into engagement with the latch in raised position to hold the latch and start bar in raised position; means connecting said pivoted lever to said pawl and operable to disengage the pawl from

the latch as the lever returns to normal when the ticket moves out of engagement with it thereby to permit the latch and start bar to move out of raised position; and means for lowering the start bar and latch to reengage the start bar with the start switch lever in readiness to initiate another cycle of operation of the machine.

6. An anti-jamming device as specified in claim 5, in which the latch includes an extension disposed alongside the start bar, which extension carries a pair of pins, one above and one below the start bar, through which pins and extension the latch is raised as the start bar is raised.

7. An anti-jamming device as specified in claim 5, in which the pivoted lever, engaged by a ticket, has a rod fixed thereon and in which the pawl carries a lever engaged by said rod to cause movement of the pivoted lever from operated position to disengage the pawl from the latch.

References Cited in the file of this patent

UNITED STATES PATENTS

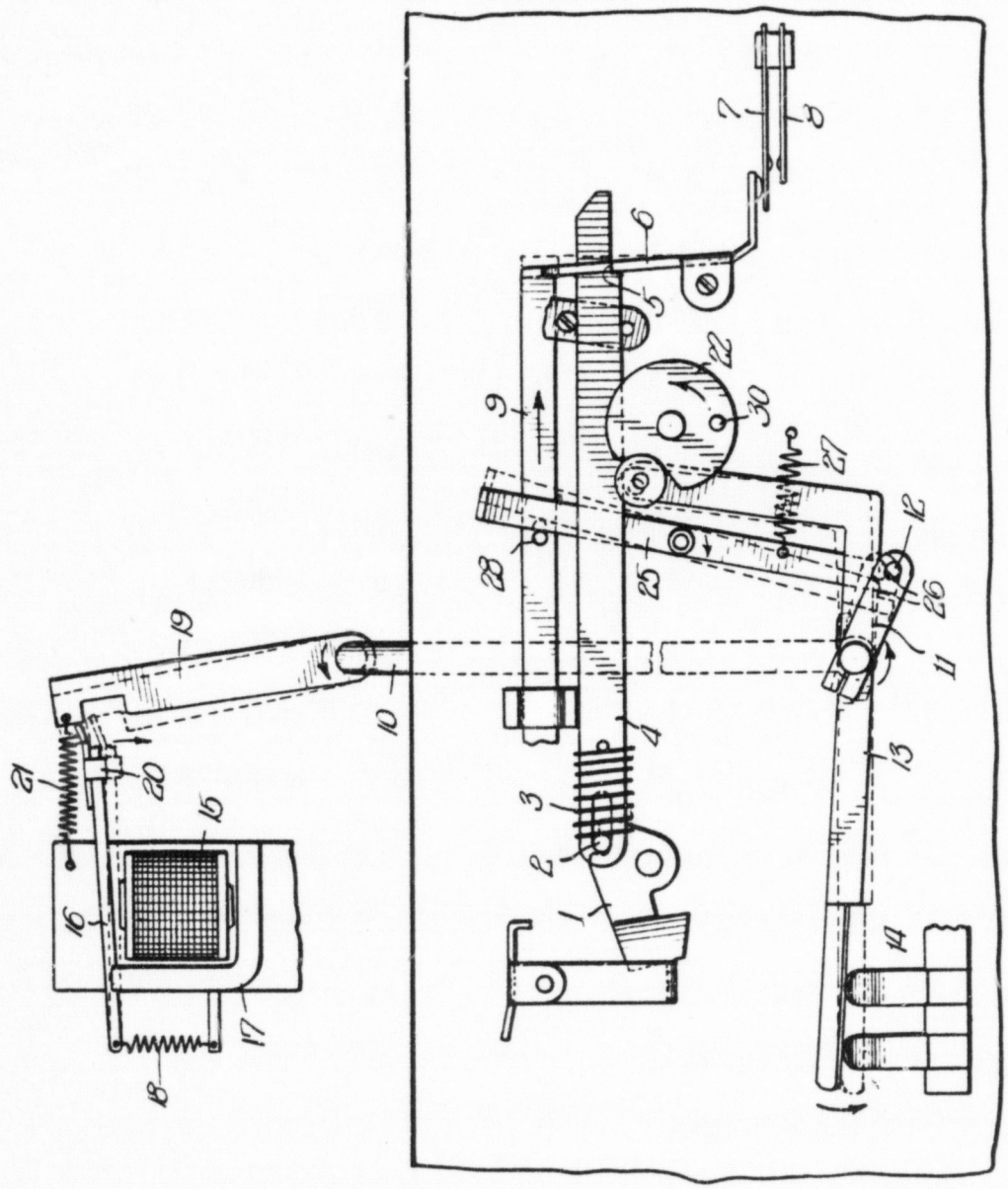
398,276	Pierce	Feb. 19, 1889
1,435,062	Helsel	Nov. 7, 1922
1,866,626	Black	Nov. 8, 1932
1,866,627	Black	Nov. 8, 1932
1,992,767	Pierson	Feb. 26, 1935
2,014,831	Helsel	May 26, 1936
2,041,831	Helsel	May 26, 1936
2,115,760	Black	May 3, 1938
2,204,897	Kilpatrick	June 18, 1940
2,571,450	Hughes	Oct. 16, 1951

A542

May 15, 1956 J. R. MONTGOMERY 2,745,914

CONTINUOUS ISSUE INTERLOCK

Filed July 30, 1953



INVENTOR.
John R. Montgomery,
BY
George H. Simmons
Atty

United States Patent Office

2,745,914

Patented May 15, 1956

2,745,914

CONTINUOUS ISSUE INTERLOCK

John R. Montgomery, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application July 30, 1953, Serial No. 371,367

5 Claims. (Cl. 200—5)

This invention relates to machines for selectively printing and issuing tickets and has for its principal object the provision of a new and improved machine of this kind.

It is a main object of the invention to provide in a machine for selectively printing and issuing tickets a device for preventing repeated operations of the machine in response to the depressing of a key therein.

Another object of the invention is to provide a device for preventing repeat operations of a selective printing and issuing ticket machine, notwithstanding the failure of devices in that machine that normally function to bring the machine to rest at the end of a cycle of operation.

Another object of the invention is to provide a device for preventing repeat operations of a ticket machine, that can be added to an existing machine with a minimum of alterations thereof.

Another object of the invention is to provide a device for preventing repeat operations of a ticket machine, that can be installed on the machine and maintained in proper operating condition at low cost.

Further objects of the invention not specifically mentioned here will be apparent from the description and claims which follow, reference being had to the accompanying drawing in which a preferred embodiment of the invention is shown by way of example.

The single figure of the drawing shows the continuous issue interlock, together with a diagrammatic showing of the parts of a ticket machine associated with the interlock.

Machines for selectively printing and issuing tickets of the type shown in Patent 1,886,626, issued to Black, November 8, 1932, contain a plurality of keys and responsive to the depressing of one of those keys the machine operates through a cycle thereby to print a ticket bearing a number corresponding to the number of the depressed key and to issue that ticket. Mechanisms within the machine function to bring it to rest in its normal position at the end of the cycle.

When such a machine is used in conjunction with a totalizator system in which the issuance of the ticket is registered in an adding machine corresponding to the depressed key and also in an adding machine common to all keys, depressing of the key effects closing of electrical circuits over which these registrations take place, and when the registrations are completed an electrical pulse is sent back to the ticket machine to set it in motion to print and issue the ticket.

It occasionally happens that through faults in the electrical circuits or in the mechanical devices of the ticket machine, the machine will repeat and issue several tickets only one of which has been registered in the adding machines. Obviously such a contingency throws the system out of balance since there are a number of unregistered tickets issued. It is to the prevention of contingencies of this kind that the present invention is particularly concerned.

In ticket machines of the type shown in the above patent, a start bar is moved longitudinally responsive to the depressing of a key thereby to close an electrical circuit over which the registrations of the ticket to be issued are made, and also a second bar is moved simultaneously with the start bar to condition the machine for operation. Within the machine is an electromagnet energized by the completion of the registrations of the ticket to cause rotation of a shaft thereby to effect the closing of the circuit to the motor of the machine to start that motor which drives the machine through its cycle. Attached to this shaft is a bell crank, and in order to prevent a repeat operation of the machine, notwithstanding the failure of electrical or mechanical devices that normally control the machine, I have provided a latching means actuated by the longitudinal movement of the second bar to clear the path of the bell crank thereby to permit it to function to start the machine.

During the cycle of the machine, the start bar and second bar are returned to normal, and with them the latching means is moved into position to block the movement of the bell crank so that at the completion of the cycle, when the circuit to the motor is opened by cams driven by that motor, it cannot be re-closed until the start bar is re-operated to effect the registrations of a ticket. With this arrangement, even though there be failures of devices normally functioning to bring the machine to rest, it will nevertheless be brought to rest at the end of the cycle in a positive manner.

Referring now to the drawing in more detail, the depressing of a key moves a latch arm 1 in a clockwise direction around its pivot thereby moving pin 2 to tension a spring 3 which ultimately moves the start bar 4 to the right. The manner in which the keys of the machine are coupled to arm 1 forms no part of the present invention and reference is here made to my co-pending application, Serial No. 364,165, filed June 25, 1953, wherein those details may be found. A shoulder 5 on start bar 4 engages the start switch lever 6 and upon movement of the start bar to the right operates this lever 6 to close spring 7 against its make contact 8 thereby to close the circuit over which registrations of the ticket to be issued is effected. Attached to the start switch lever 6 is a longitudinally movable bar 9 through the operation of which the machine is conditioned for operation in the manner pointed out in the above mentioned Black patent.

Mounted in the end plates of the machine and extending therebetween is a shaft 10 to which a bell crank 11 is fixed. This bell crank carries a pin 12 which projects under switch arm 13 so that movement of the shaft 10 counterclockwise, as indicated by the arrow, will elevate this pin 12 and thereby operate the switch arm 13 to close the motor circuit switch 14 in the obvious manner. Mounted upon the side plate of the machine is an electromagnet 15 having an armature 16 pivotally mounted upon the heel piece 17 of the magnet. A spring 18 retains the armature 16 in its normal position. Fixed upon the shaft 10 is a notched lever 19, the end of which is normally held against a stop 20 on the armature 16 by a spring 21.

As soon as registrations of the ticket in the adding machines have been completed, magnet 15 is energized preferably in the manner pointed out in Patent 2,182,875, issued to Levy December 12, 1939, whereupon armature 16 is drawn down against the core of the magnet and stop 20 is moved into registration with the notch in lever 19. This permits spring 21 to pull lever 19 to the left thereby rotating shaft 10 counterclockwise to close the switch 14 as above. The motor being thus started drives the machine and rotates cam 22 counterclockwise, as indicated by the arrow, thereby to maintain the switch arm 13 in its operative position independently of the pin 12 throughout a cycle of operations of the machine.

The circuit of magnet 15 is closed but momentarily and that magnet soon de-energizes and releases its arma-

ture 16. During the cycle of operation of the machine, lever 19 is rotated in a clockwise direction by mechanism in the machine forming no part of the present invention, and spring 18 restores armature 16 to normal thereby replacing stop 20 in the path of lever 19 to prevent re-operation of that lever until magnet 15 is again operated.

Pivotally mounted upon the end plate of the machine is a latch 25 at the lower end of which is a shoulder 26 that is positioned in the path of pin 12 when the lever 25 is in its normal position in which it is shown in full lines. A spring 27 maintains this lever in normal position. Mounted upon the bar 9 is a pin 28 that bears against the lever 25 so that when the bar 9 is moved to the right as above, latch 25 will be rotated counterclockwise into the position in which it is shown in dotted lines, in which position shoulder 26 is moved out of the path of pin 12.

During the cycle of operation of the machine, rotation of the cam 22 moves the pin 30 into engagement with the start lever 4, thereby elevating that lever to disengage shoulder 5 from the start switch lever 6, thereby to permit the tension of spring 7 to restore the lever 6 to its normal position. Bar 9 is thus moved to the left permitting spring 27 to restore latch 25 into the position in which it blocks upward movement of the pin 12.

In the event of a faulty electrical circuit resulting in maintaining magnet 15 energized throughout the cycle of the machine, or failure of spring 18 to restore the armature 16 to normal position, were it not for the shoulder 26 on latch 25 locking the upward movement of pin 12, spring 21 could re-operate lever 19 and thereby initiate a new cycle of operation of the machine, notwithstanding that spring 7 would not be re-operated into engagement with its make contact 8 and the issuance of a second ticket therefore would not be registered in the adding machines. Since shoulder 26 blocks the path of pin 12 at all times, except when the start bar has moved switch arm 6 to close spring 7 against its make contact 8, latch 25 definitely prevents the issuance of tickets which have not been registered in the adding machines.

The device of the present invention can be installed upon existing ticket machines of the aforementioned type at low cost and maintained in proper operating condition with a minimum of servicing. It definitely prevents repeat operations of the machine and consequently prevents the issuance of tickets which have not been properly registered in the adding machine.

While I have chosen to illustrate my invention by showing and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a machine for selectively printing and issuing tickets; a start switch; a bar moved longitudinally to operate said start switch to initiate an operation of the machine; a shaft; a bell crank fixed on said shaft; a motor switch; means for rotating said shaft thereby to move said bell crank to close said motor switch; a pivoted latch; a shoulder on said latch normally blocking movement of said bell crank; and a bar controlled by said start switch for moving said latch thereby to move said shoulder out of the path of said bell crank when the start switch is in operated position thereby to permit movement of the bell crank to close said motor switch.

2. In a machine for selectively printing and issuing tickets; a start switch; means for moving said start switch from normal to operated position to initiate a cycle of operation of the machine and for maintaining the switch closed during a portion of the cycle; a motor switch; means for closing said motor switch to operate the machine through a cycle; cam means for maintaining said motor switch closed independently of said means for closing the switch; and latch means connected to and operated by said start switch for preventing an operation of the means for closing the motor switch except when the start switch is in its operated position.

3. In a machine for selectively printing and issuing tickets; a start switch; a bar moved longitudinally to operate said start switch to initiate an operation of the machine; a second bar connected to the start switch and moved longitudinally by an operation thereof; a shaft; a bell crank upon said shaft; a motor switch; means for rotating said shaft thereby to rotate said bell crank to operate said motor switch; a pin on said second bar; a pivoted latch engaging said pin; a shoulder upon said latch normally blocking movement of said bell crank, said shoulder being moved out of the path of said bell crank by said pin during said longitudinal movement of said second bar thereby to permit rotation of the bell crank to operate said motor switch.

4. In a machine for selectively printing and issuing tickets; a motor switch; a rotatable shaft; a bell crank fixed on said shaft and engaging said motor switch to operate the same to closed position as the shaft rotates; a notched lever fixed upon said shaft; a spring attached to said lever and tensioned to move the lever and thereby rotate said shaft; an electromagnet; an armature on said magnet; a stop on said armature normally engaging said lever to prevent said spring from moving it, said stop moving into the notch in the lever upon energization of the magnet thereby to permit movement of the lever under the influence of said spring; a start switch; means for moving said start switch from normal to operated position; a latch; a shoulder on said latch normally blocking movement of the bell crank to operate said motor switch; and a bar connected to and operated by said start switch moving to operated position for operating said latch to remove said shoulder from blocking position thereby to permit closing the motor switch only when said start switch and said electromagnet are simultaneously in operated position.

5. In a machine for selectively printing and issuing tickets; a start switch; a longitudinally movable bar; a shoulder on said bar engaging said start switch to cause longitudinal movement of the bar to operate the switch to initiate an operation of the machine; a motor switch; a shaft; a crank arm fixed on said shaft; means for rotating said shaft thereby to move said crank arm to close said motor switch; cam means for maintaining said motor switch closed independently of said crank arm which is returned to its normal position during an operation of the machine; a pivoted latch; a shoulder on said latch normally blocking movement of said crank arm in the direction to operate said motor switch; means for moving said latch shoulder out of blocking position as said start switch moves to its operated position; means on said cam means for moving the shoulder on said bar out of engagement with said start switch during the operation of said machine, said start switch restoring to normal and said latch shoulder being returned thereby to blocking position to prevent further movement of said crank arm until said start switch is again operated.

References Cited in the file of this patent

UNITED STATES PATENTS

2,020,594 Webb ---------- Nov. 12, 1935

Dec. 12, 1939. O. C. LEVY 2,182,875

TOTALIZING SYSTEM

Filed Sept. 12, 1936 2 Sheets-Sheet 1

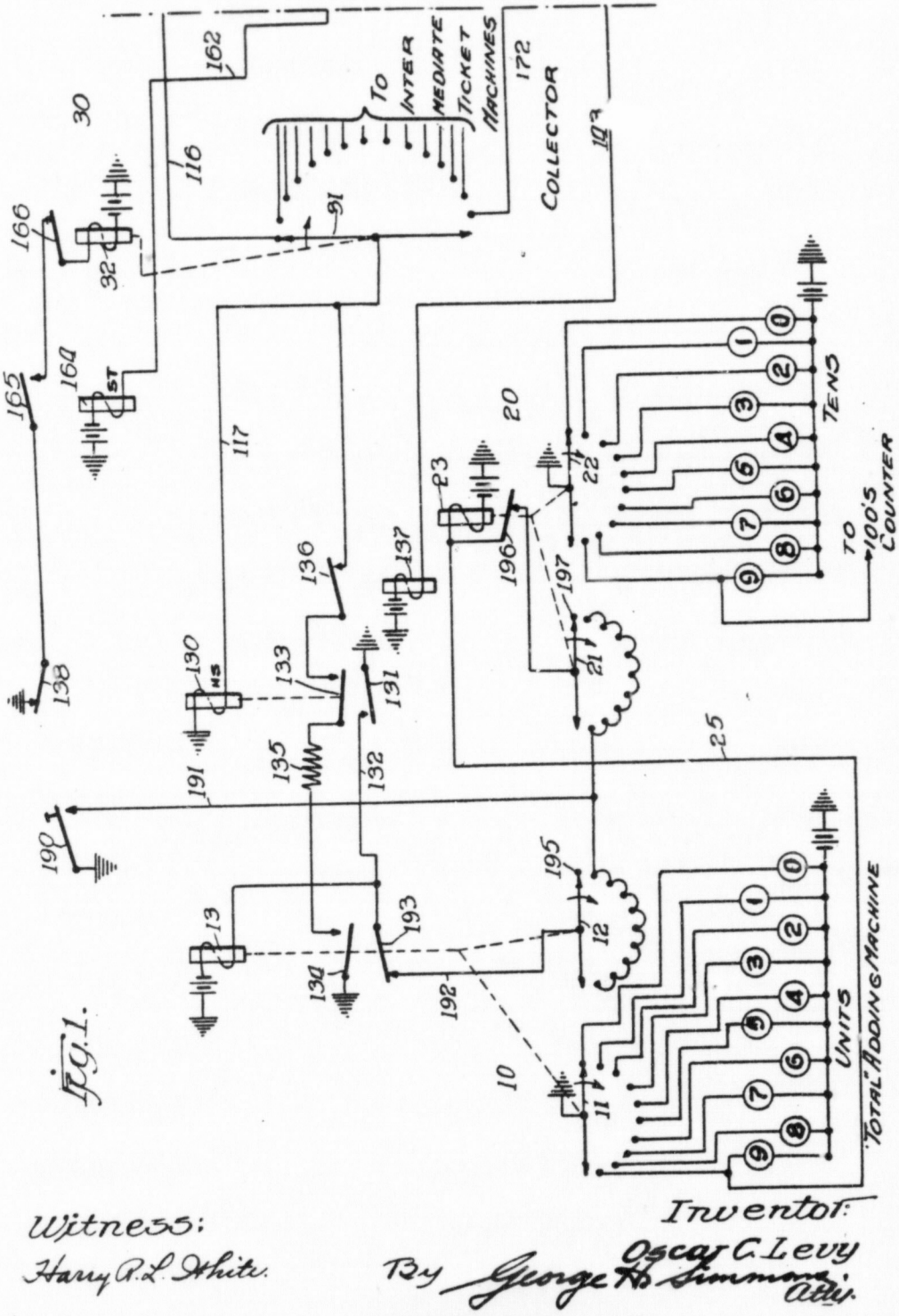


Fig. 1.

Witness:
Harry R. L. White

Inventor:
Oscar C. Levy
By George H. Simmons
Atty.

A546

Dec. 12, 1939. O. C. LEVY 2,182,875

TOTALIZING SYSTEM

Filed Sept. 12, 1936 2 Sheets-Sheet 2

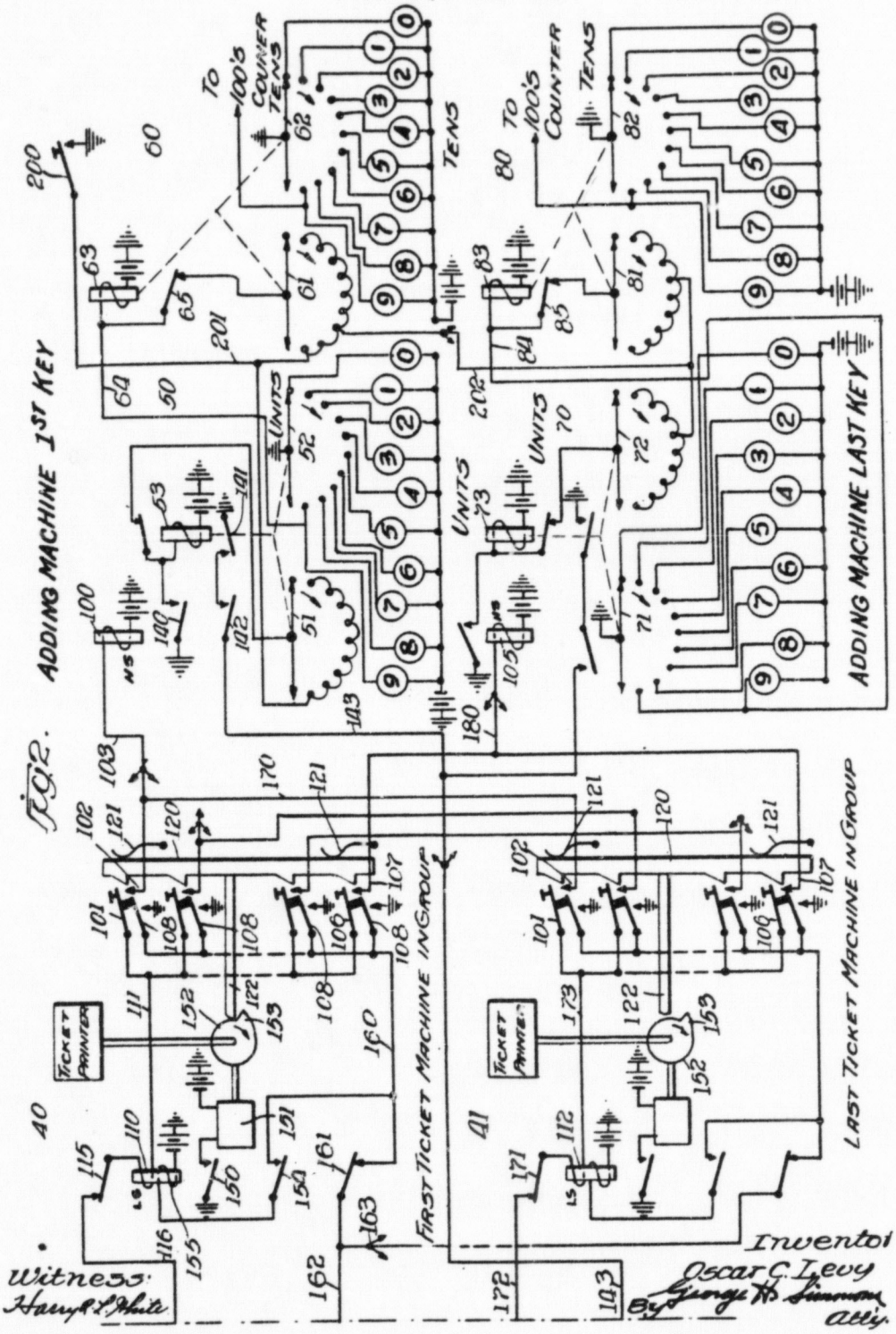


FIG. 2.

Patented Dec. 12, 1939 2,182,875

UNITED STATES PATENT OFFICE

2,182,875

TOTALIZING SYSTEM

Oscar C. Levy, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application September 12, 1936, Serial No. 100,464

8 Claims. (Cl. 235—92)

This invention relates to totalizing systems, and has for its principal object the provision of a new and improved system of this kind that is cheaper to manufacture and operate and is rapid and more reliable in its operation.

A totalizer may be defined as a device arranged to count and add separately operations of each kind performed by several devices of a group, and to simultaneously count and add the total number of operations of all kinds performed by the devices of the group and to display said sums on suitable indicators. Thus when used in connection with a group of ticket issuing machines which are capable of issuing a number of kinds of tickets, the totalizer through individual adding machine counts and displays the number of tickets of each kind issued by all of the ticket machines in the group and also through a total adding machine counts and displays the total number of tickets of all kinds issued by all of the machines of the group.

It is an object of the present invention to provide a totalizing system associated with the ticket issuing machines and arranged to be momentarily connected with the total adding machine one at a time and in definite sequence.

Another object of the invention lies in the provision of a collector associated with the total adding machine that is normally at rest and is started by a preparatory operation of a ticket machine to select that machine.

A further object lies in establishing a series circuit through the total adding machine, collector, ticket machine and individual adding machine over which circuit those mechanisms are controlled.

Still another object of the invention lies in the provision of a control for the collector operated over the series circuit to stop the collector and maintain the circuit closed until the adding machines have operated to register the issuance of a ticket.

Still another object lies in the provision of a means for acknowledging the registering of a preparatory operation of the ticket machine in the individual and total adding machines.

It is a further object to provide for controlling the ticket machine by the acknowledging means over the series circuit to initiate a ticket issuing operation of the machine.

A further object provides for releasing the total adding machine, individual adding machine and collector immediately upon the initiation of the ticket issuing operation of the ticket machine, to render these devices immediately available to other ticket machines.

Further objects of the invention not specifically enumerated here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment is shown by way of example and in which:

Figure 1 is a schematic wiring diagram of the total adding machine and associated collector; and,

Figure 2 is a schematic wiring diagram of the ticket machines and associated individual adding machines.

In the totalizing system shown in the drawings, a plurality of ticket machines are arranged in a group and each ticket machine is arranged to print and issue tickets of various denominations or kinds under control of an actuating key in the machine. There is provided a separate key for each denomination of ticket that the machine is adapted to issue, and responsive to an operation of a particular key, the machine is prepared to issue a ticket of the corresponding denomination. The ticket machines per se are not of the essence of the present invention as there are a number of machines of this type available upon the open market which may be used in connection with the present invention. Patent Numbers 1,886,626 and 1,886,627, issued to H. D. Black on November 8, 1932, show one form of machine suitable for use in this connection and reference is here made to these patents for the details of construction and operation of the machines.

Associated with the ticket machines are a plurality of adding machines that are associated with corresponding keys in each of the ticket machines of the group and individual thereto and are arranged to count and indicate the total number of tickets of a particular denomination issued by all of the ticket machines of the group For convenience herein, these adding machines are referred to as individual adding machines.

In the totalizing system shown in the drawings, there is also provided an adding machine which is similar in structure to the previously mentioned counting devices and is adapted to count and indicate the total number of tickets of all denominations issued by all of the ticket machines of the group. For convenience herein, this adding machine is referred to as the total adding machine. A collector is associated with the total adding machine and adapted to selectively connect it with the ticket machines, one

at a time and in definite sequence, thereby to prepare the system for operation, as will presently appear.

Referring now to the drawings in more detail, the total adding machine is shown as consisting of a stepping switch 10 having wipers 11 and 12 that are adapted to be driven over associated banks of contacts by an energization and deenergization of a motor-magnet 13. Preferably the motor-magnet is arranged to advance the wipers upon de-energization, switches of this type being well known to those skilled in the art. Switch 10 is shown arranged to register the units digit of the total number of tickets issued by the group and the banks of contacts over which the wipers pass are shown to contain ten contacts.

A second and similar switch 20 consists of wipers 21 and 22 and a motor-magnet 23 and is adapted to register the 10's digit of the total number of tickets issued by the ticket machine. The adding machine thus formed may be extended, as will presently appear, by the inclusion of other similar stepping switches so as to enable the machine to count 100's and 1,000's digits as well as units and 10's as shown.

While the total adding machine is shown as composed of stepping switches, this showing is made by way of example only, as it will be readily appreciated that relay counting chains or electromagnetically operated mechanical counters may be substituted within the teachings of the invention.

Figure 1 also shows a collector 30 which consists of a wiper 31 and motor magnet 32, which together form a stepping switch of the same type as stepping switches 10 and 20. The bank of contacts over which wiper 31 moves is shown to have a greater number of contacts than the banks of switches 10 and 20. Stepping switches of this type are available with 25 contacts in the bank, and through the use of such a switch the collector may selectively establish a connection with each one of 25 ticket machines in definite sequence.

A group of 25 ticket machines may be connected to the bank of a collector 30, with one machine to each contact in the bank, those machines being individual to those contacts and those contacts only. Since the wiper 31 engages the contacts sequentially one at a time, in case two or more ticket machines are operated simultaneously to initiate the function of issuing a ticket, no harm results since the ticket will not be issued by a machine until the collector wiper 31 is at rest on the bank contact leading to that ticket machine. Since no other collector has access to that group of ticket machines, each and every ticket issued is issued only after its issuance has been registered.

In Figure 2, in the upper left hand corner, I have shown a ticket machine 40 indicated as the "1st ticket machine in group" for the reason that it is connected to the 1st contact in the bank over which passes wiper 31 of the collector. Immediately below ticket machine 40 is a 2nd and similar ticket machine 41 designated as the "last ticket machine in group" for the reason that it is connected to the last contact of the bank of wiper 31. It will be understood that other ticket machines similar to 40 and 41 may be included in the group and connected to the collector bank intermediate to the 1st and last contacts.

In the upper right hand corner of Figure 2 there is shown an individual adding machine bearing the legend "adding machine 1st key", which is an individual adding machine similar to the total adding machine and comprising a stepping switch 50 having wipers 51 and 52 and a motor magnet 53 and adapted to register the unit's digit of the total number of tickets of a particular denomination issued by the ticket machines responsive to an operation of the 1st keys thereof, and a second stepping switch 60 comprising wipers 61 and 62 and a motor magnet 63 which is adapted to register the 10's digit of the number.

Immediately below the adding machine comprising stepping switches 50 and 60 is a similar adding machine comprising a stepping switch 70 having wipers 71 and 72 and a motor magnet 73 and a second stepping switch 80 having wipers 81 and 82 and a motor magnet 83, which adding machine is associated with the last key of the ticket machines and adapted to count the unit's and 10's digits respectively of the number of tickets of the denomination issued by the ticket machines responsive to an operation of the last key therein.

It will be understood that additional adding machines similar to the above will be provided and associated with the intermediate keys of the ticket machines, and that inasmuch as the ticket machines may have as many as 40 keys, there may be as many as 40 adding machines provided, there being one for each key. It will be further understood that the adding machines indicated in Figure 2 are shown by way of example only and that relay counting chains or electro-magnetically operated mechanical counters may be substituted within the teachings of the invention, and that the devices may be expanded to count more than the unit's and 10's digits shown.

Each of the adding machines is provided with a high sensitivity control relay, such as the relay 100 which is associated with the adding machine comprising switches 50 and 60. One terminal of this relay is connected to a source of electrical current, preferably a battery of about 50 volts potential. Each of the ticket machines contains a key 101 which is operable to prepare the machine to issue a ticket of the denomination that is to be registered by the 1st adding machine and the other terminal of relay 100 is multipled to a make contact 102 of the key 101 by a multiple conductor 103. Similarly, the high sensitivity relay 105 of the last key adding machine is multipled to a make contact 107 of the last key 106 in each of the ticket machines.

Ticket machine 40 is provided with a low sensitivity control relay 110 which has a low resistance starting winding, one terminal of which is multipled to the main springs of each of the keys 101—106 of the machine by a conductor 111. Ticket machine 41 and each of the other ticket machines, not shown, are similarly provided with a low sensitivity relay such as 112 which is multipled by conductor 113 to the main springs of the keys of that machine.

Throughout the drawings there are shown several batteries to which the several relays and magnets are connected, this arrangement being for convenience and simplification. In an actual installation of a system embodying the teachings of the invention, there will ordinarily be but one battery, preferably having its positive terminal grounded.

An operation of the system is initiated by depressing one of the keys of one of the ticket machines to prepare that machine to issue a ticket of the chosen denomination. Assume for the

moment that key 101 of the ticket machine 40 is operated. As explained in the foregoing patents, depressing one key locks the other keys so that only one key of a ticket machine may be depressed at a time. A latch 120 engages the main spring of the key to lock it in depressed position. The operation of main spring 101 prepares a circuit for relays 110 and 100 which is extended from battery through the winding of relay 100, conductor 103, contact 102, and main spring 101 engaged thereby, conductor 111, through the upper winding of relay 110 through the main spring and break contact 115 of relay 110, conductor 116, to the 1st bank contact of the collector with which contact wiper 31 is assumed to be engaged at the moment. The circuit is extended through wiper 31 and conductor 117 through the winding of high sensitivity control relay 130 of the total adding machine to ground. Relays 100 and 130 are high sensitivity relays and have between them sufficient resistance to limit the current flowing in the above traced circuit to such a low value that the low sensitivity relay 110 of the ticket machine is not operated, but the high sensitivity relays are operated. Relay 130, in addition to being a high sensitivity relay, that is one having a relatively high ampere-turn strength, is so wound as to be high speed in its operation, and when energized in series with relays 100 and 110, will operate before relay 100.

The energization of relay 130 closes a circuit from ground through main spring 131 and the make contact engaged thereby, conductor 132, through the winding of magnet 13 to battery, energizing that magnet preparatory to advancing the wipers 10 and 11 one step to register the operation of key 101. Energization of relay 130 also closes main spring 133 against its make contact, and energization of motor magnet 13 extends a circuit from ground through main spring 134, resistor 135, main spring 133 and its make contact, to the main spring 136 of the acknowledging relay 137, however, since this relay is not yet energized, this circuit extends no further. The operation of relay 130 also opens main spring 138 from its break contact to open a point in the circuit of the motor magnet 32 of the collector 30 to prevent energization of that magnet until relay 130 is restored.

The operation of relay 100 in the 1st key adding machine closes a circuit from ground through main spring 140, through the winding of magnet 53 of stepping device 50 to battery, energizing that magnet preparatory to advancing the wipers of the switch. The energization of magnet 53 closes a circuit from ground through main spring 141 and its make contact, through main spring 142 of relay 100 and its make contact, conductor 143, through the winding of relay 137 (Figure 1) to battery, energizing the relay 137. The circuit that was extended from ground through resistor 135 to the main spring 136 of relay 137 is now extended through the make contact of that main spring to conductor 117 through wiper 31 and over the previously traced series circuit through relays 110 and 100. The resistance of resistor 135 is less than the resistance of high sensitivity relay 130 with which it is now connected in parallel, and the current flow in the series circuit is increased sufficiently to cause low sensitivity relay 110 to be energized. Although resistor 135 shunts relay 130, the resistance of the shunt is sufficiently high to permit enough current to pass through the relay winding to maintain the relay in its operated position.

Relay 110, upon energizing, closes a locking circuit for itself which may be traced from ground through spring 108 and its make contact, conductor 160, spring 154, and its make contact, through the lower winding 155 of relay 110 to battery. Relay 110 also closes a circuit from ground through springs 150, through the motor 151 to battery, thereby causing the motor to operate the ticket machine to print and issue a ticket in the manner explained in the above referred to patents. The operation of motor 151 rotates to cam 152 in the direction indicated by the arrow to move the hill 153 of the cam into engagement with the push rod 122 and to move that push rod and the latching lever 120 to the right, Figure 2, against the tension of springs 121. This releases the key 101 to permit it to restore and thereby restore the ticket machine to normal and in readiness for a subsequent operation.

The energization of relay 110 opens spring 115 from its break contact, thereby to open the series circuit through relays 100, 110 and 130 before the operation of the ticket machine has been completed and the circuit opened by the restoration of key 101. Relay 100 falls back immediately and opens springs 140, thereby to break the circuit of magnet 53 to permit that magnet to de-energize and advance wipers 51 and 52 one step. De-energization of relay 100 opens springs 142 to break the previously traced circuit of relay 137 to permit that relay to restore to normal. De-energization of relay 130 opens the circuit of magnet 13 at springs 131 to permit that magnet to restore to normal and advance wipers 11 and 12 one step, and at springs 138, closes a point in the circuit of magnet 32 to prepare that magnet for operation, as will presently appear.

As shown in the drawings, the contacts engaged by wiper 11 of the stepping switch 10 are connected to indicating devices shown as circles containing the legends "0–9" and a circuit is closed from ground through the wiper to battery through the indicating device. The indicating device may be lamps provided with suitable caps bearing the legends, or may be any other preferred type of indicating device, such as for example, an indicator of the type shown in the Patent 1,967,887 issued to Johnston on July 24, 1934. Normally the units and 10's indicating devices both indicate zero and when the stepping switch 10 is moved one step, as above explained, the zero indication will be erased by the movement of wiper 11 from its normal to its 1st position contact and indication of 1 will be substituted. Successive operations of the stepping switches move the wiper 11 to successively operate the indicators until indicator 9 is illuminated, at which time a parallel circuit is closed from ground through wiper 11, conductor 25, through the winding of motor magnet 23 of stepping switch 20 to battery, to energize that magnet preparatory to advancing wipers 21 and 22 one step. When the circuit of magnet 13 of stepping switch 10 is again broken, wiper 11 moves off of number 9 contact and back into engagement with the number 0 contact, thereby breaking the circuit of magnet 23 which de-energizes and advances wiper 22 from its 0 contact into its number 1 contact and the total adding machine thus indicates 10.

In Figure 1, I have shown a multiplied connection from number 9 lamp in the 10's indicator

A550

leading to a legend "to 100's counter", which may be provided to enable the total adding machine to register a larger number of tickets. The 100's counter is a duplicate of the 10's counter and connected in the same way, and has been omitted from the drawings to avoid an unnecessary complication thereof.

In the adding machine associated with the 1st key, the 10th contact of the bank engaged by wiper 52 is connected by conductor 64 to the winding of motor magnet 63 of the 10's counter so that that magnet will be operated as wiper 52 moves from its number 9 to its 0 position and 10's legend indications are brought up in the same manner as previously explained.

In the foregoing cycle of operation, it was assumed that the wiper 31 was standing in engagement with the contact leading to the ticket machine that was operated. The collector has no normal position and when at rest, remains in the position last used so such an operation may frequently occur. However, in a majority of instances, the wiper 31 will not be associated with the ticket machine in which is operated a key such as key 101 and consequently the collector must be stepped to bring it into engagement with that ticket machine.

To this end, each of the keys 100—106 in each of the ticket machines is provided with a second set of contacts, insulated from the first, and comprising a main spring 108 and associated make contact. All of the main springs 108 of one ticket machine are multiplied together to a conductor 160, which extends through normally closed spring contacts 161 that are controlled by the control relay 110 of the machine. A start wire 162 is multiplied into each of the ticket machines as indicated at 163, Figure 2, so that closing of any one of the keys in any one of the ticket machines will complete a circuit from ground through the springs 108, conductor 160, contacts 161, conductor 162, through the winding of start relay 164 to battery, energizing this relay. A circuit may be then traced from ground through the normally closed contacts 138 controlled by relay 130, through spring 165 and its make contact, through normally closed contact [illegible] controlled by motor magnet 32, through the [illegible]ng of the motor magnet 32 to battery. [illegible]et 32 is energized over this circuit and pre[illegible] to advance wiper 31 of the collector one step, and opens its own circuit by opening springs 166, whereupon the magnet de-energizes to advance the wipers. De-energization of magnet 32 again closes the circuit just traced and the operation is repeated, the magnet operating buzzer like to rapidly advance wiper 31. When the wiper comes into engagement with the contact leading to the relay of the ticket machine in which the key was operated, such as for example, the contact to which conductor 116 is connected, the series circuit through relay 130, relay 110, and relay 100 is completed as before. Relay 130, as previously explained, is a high speed relay and will operate more rapidly than the motor magnet 32 and consequently will open the circuit of the magnet, by opening springs 138, before the magnet has had time to again energize. As a result of this operation the collector is stopped when it becomes associated with a ticket machine in which there is a depressed key and the cycle of operation hereinbefore explained is effected.

The operation of the last ticket machine of the group is identical with the hereinbefore described operation of the 1st ticket machine and need not be repeated in detail. Should the last machine be operated by depressing key 101 therein to prepare that machine to issue a ticket of the 1st denomination, series circuit from the relay 100 is prepared through conductor 103, conductor 170 through the make contact and main spring of the key 101 in the last ticket machine, conductor 173, the upper winding of relay 112, normally closed contact 171 controlled by that relay, conductor 172, which terminates upon the last contact in the bank of the collector, the circuit being extended through wiper 31 and conductor 117 to ground through the relay 130 as before.

An operation of key 106 in the 1st ticket machine to prepare that machine to issue a ticket of the last denomination prepares a circuit for the control relay 105 of the last individual adding machine which extends from battery through the winding of that relay, conductor 180, through the make contact 187 and main spring 106 associated therewith, conductor 111, thence over the previously traced circuit through relays 110 and 130. An operation of the key 106 in the last ticket machine extends a similar circuit from conductor 180 through make contact 107 and main spring 106 of the last ticket machine, conductor 173, the upper winding of relay 112, and thence through the previously traced circuit to the winding of relay 130.

From the foregoing it will be apparent that an operation of a key in any one of the ticket machines, to prepare that ticket machine to issue a ticket of a particular denomination, prepares a circuit extending to the individual adding machine in which the tickets of that denomination are registered. The depressing of the key also closes a starting circuit by which the normally at rest collector is started to search out and find the ticket machine containing the depressed key. When such selection is made, a series circuit is extended through a control relay in a total adding machine, a control relay in the ticket machine, and a control relay in the individual adding machine, over which circuit the respective devices are actuated. The collector is stopped to maintain the connection so long as the same is needed. The operation of the control relay and motor magnet of the counting mechanism in the individual adding machine prepares a circuit for operating the ticket machine. The operation of the control relay and magnet of the counting mechanism in the total adding machine completes the circuit for operating the control relay in the ticket machine. Thus it will be seen that a ticket cannot be issued until its issuance is registered in the individual adding machine for the selected denomination of ticket and in the total adding machine.

Immediately upon operation of the control relay of the ticket machine, the circuit through the control relays is broken to render the total adding machine, collector and individual adding machine immediately available to other ticket machines. The energization of this control relay also causes an operation of the ticket machine which is released only after it has been completely operated and the ticket issued therefrom.

Thus it will be seen that I have provided a totalizing system that possesses many advantages. It is simple in its construction and reliable in its operation, each step of the operation being dependent upon the successful completion of a previous step.

In order to reset the equipment back into the

normal position in which it is shown in the drawings, there is provided a re-set key 196, Figure 1, which, when closed, completes a circuit from ground through conductor 191, through the multipled contacts of the bank of switch 10 engaged by wiper 12, conductor 192, normally closed contact 193, controlled by motor magnet 13, through the winding of motor magnet 13 to battery. Magnet 13 is energized over this circuit and opens its own circuit by opening contacts 193, whereupon the magnet de-energizes and advances the switch wipers. Upon de-energization, the magnet 13 closes its own circuit so long as the wiper 12 engages the multipled contacts of its bank. The normal position contact 195 is not included in the multiple and the switch comes to rest when wiper 12 engages that contact.

The operation of re-set key 196 also extends a circuit from ground through the multipled contacts of the switch 20 over which wiper 21 passes, to complete a circuit through normally closed contacts 196 through the winding of magnet 23, to battery, to operate that magnet buzzer fashion to advance wipers 21 and 22 until wiper 21 engages contact 197 which is not included in the multiple.

A similar re-set key 200 is associated with the group of individual adding machines associated with the ticket machines and, when closed, extends a circuit over conductor 201 to the multipled bank contacts of switch 60 engaged by wiper 61, also to the multipled bank contacts of switch 50 engaged by wiper 51, and also over conductor 202 to the multipled contacts of the switch 70 engaged by wiper 72 and the multipled contacts of switch 80 engaged by wiper 81, and also to similar banks in each of the stepping switches of the group. The motor magnets of the respective stepping switches are operated in a buzzer like manner over this circuit to bring their respective wipers into normal position.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it used in connection with a ticket issuing machine, I have done so by way of example only as the system may be used in other connections within the teachings of the invention. Further, the specific instrumentalities of the embodiment shown by way of example may be modified by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. The combination with a plurality of electrical devices operable together in combinations of three, of control means therefor comprising a high sensitivity relay in each of two devices of the combination, a low sensitivity relay in the third device of the combination, means for establishing a series circuit through the three relays, means for energizing said circuit to operate the high sensitivity relays thereover to control the associated devices, means for shunting one of said high sensitivity relays to increase the current flow in said circuit and thereby operate the low sensitivity relay, and means including contacts opened by the low sensitivity relay for breaking said series circuit.

2. The combination of a plurality of electrically controlled machines, a plurality of electrically controlled individual adding machines, a relay in each of said machines and individual adding machines means in each machine operable to temporarily directly connect one of the individual adding machines therewith, a total adding machine, a control relay therein, a collector, a start relay therein, means operated by said direct connecting means for energizing said start relay, means responsive to the energization of said start relay for operating said collector to temporarily connect together the total adding machine to the operated machine and individual adding machine, means for operating the control relays in said connected devices, and means responsive to the operation of said relays for breaking the connection between said devices.

3. The combination with a plurality of electrical devices grouped in three groups and operable together in combinations of three, one device from each group, of control means therefor comprising a high sensitivity relay in each of two devices of the combination, a low sensitivity relay in the third device of the combination, operation initiating means in the devices of one group operable to connect together a device in each of two of the groups, a collector associated with the third group, means responsive to an operation of said operation initiating means for operating said collector to complete said combination by establishing a series circuit through the three relays thereof, means for energizing said circuit to operate the high sensitivity relays thereover to control the associated devices, means in one of said devices for increasing the energization of said circuit and thereby operate the low sensitivity relay, and means operated by the low sensitivity relay for breaking said circuit.

4. In a totalizing system, a group of ticket machines, a plurality of keys in each machine, a plurality of individual adding machines corresponding in number to the number of said keys, a control relay in each adding machine, circuit means directly and permanently connecting each control relay to the corresponding key in each of said ticket machines, a relay in each ticket machine, circuit means connecting one terminal of each relay to all the keys of that machine, a total adding machine, a relay therein, a collector, circuit means including said collector for establishing a circuit from said total adding machine to the other terminals of said ticket machine relays one at a time in definite sequence and arranged to establish a series circuit through said relays, means for energizing said relays over said circuit, means controlled by said total adding machine relay for maintaining said circuit closed, and means controlled by the ticket machine relay for opening said circuit.

5. In a totalizing system, a plurality of ticket issuing machines, a plurality of actuating keys in each machine, each key having a main spring and a make contact closed together when the key is depressed, a relay in each machine, circuit means connecting one terminal of said relay to each of said main springs, a plurality of individual adding machines corresponding in number to the number of said keys, a relay in each adding machine, circuit means connecting each one of said relays to a said make contact of the corresponding key in each one of said ticket machines, a total adding machine, a relay therein, means for connecting one terminal of said latter relay to the free terminals of said relays in said ticket machines one at a time and

in sequence, a source of current one terminal of which is connected to the other terminal of said total adding machine relay and the opposite terminal of which is connected to the free terminals of said individual adding machine relays, said connecting means closing a circuit from said source of current through said total adding machine relay, the relay of a ticket machine, a closed key in said machine and the relay in the corresponding individual adding machine, said total adding machine relay and said individual adding machine relay operating over said circuit to register the operation of the ticket machine key, and means actuated by the operation of said relays for operating said ticket machine relay to initiate an operation of the machine to issue a ticket.

6. In a totalizing system, a plurality of individual adding machines, a control relay in each machine, a magnet in each adding machine, circuit means for said magnet closed by said control relay in operated position for operating the magnet, a plurality of ticket issuing machines, a control relay in each machine, means in each ticket machine for extending a circuit from the ticket machine relay to the control relay of one of said individual adding machines, a total adding machine, a control relay therein, a magnet in said total adding machine, circuit means for said magnet closed by said control relay in operated position for operating the magnet, a normally at rest collector, a start relay in said collector, means in said ticket machine controlled by said circuit extending means for closing a circuit for said start relay, means controlled by said start relay for operating said collector to select said ticket machine and to extend said circuit through said total adding machine control relay to energize that relay and the individual adding machine relay, means controlled by said total adding machine relay for stopping said collector to maintain said circuit closed, means controlled jointly by said individual adding machine relay and magnet and said total adding machine relay and magnet for operating said ticket machine relay over said circuit, and means controlled by said ticket machine relay for opening said circuit.

7. In a totalizing system, a plurality of individual adding machines, a control relay and a magnet in each of said machines, circuit means for said magnet closed by said control relay in operated position for operating the magnet, a plurality of ticket issuing machines, a control relay in each machine, means in each ticket machine for extending a circuit from the ticket machine relay to the control relay of one of said individual adding machines, a total adding machine, a control relay and a magnet in said total adding machine, circuit means for said magnet closed by said control relay in operated position for operating the magnet, a normally at rest collector, a start relay in said collector, means in said ticket machine controlled by said circuit extending means for closing a circuit for said start relay, means controlled by said start relay for operating said collector to select said ticket machine and to extend said circuit through said total adding machine control relay to energize that relay and the individual adding machine relay, means controlled by said total adding machine relay for stopping said collector to maintain said circuit closed, an acknowledging relay, a circuit for said relay closed jointly by said individual adding machine relay and magnet in operated position, means controlled by said acknowledging relay for shunting a grounded resistance around said total adding machine relay to operate said ticket machine relay over said circuit, and means controlled by said ticket machine relay for opening said circuit.

8. In a totalizer system, a total adding machine, a ticket machine, an individual adding machine, a relay in each of said machines, means for establishing a circuit through said relays in series, means for operating the total adding machine relay and the individual adding machine relay over said circuit, magnet means in said total adding machine and individual adding machines, an acknowledging relay, circuit means for said acknowledging relay controlled jointly by the magnet means and relay of said individual adding machine for energizing said acknowledging relay, means controlled jointly by said total adding machine magnet means and relay and said acknowledging relay for energizing the ticket machine relay over said series circuit, means actuated by said ticket machine relay for opening said series circuit, and means controlled by said ticket machine relay for operating said ticket machine.

OSCAR C. LEVY.

Nov. 14, 1939. O. C. LEVY ET AL 2,179,698

TOTALIZING SYSTEM

Filed Feb. 15, 1937 2 Sheets-Sheet 1

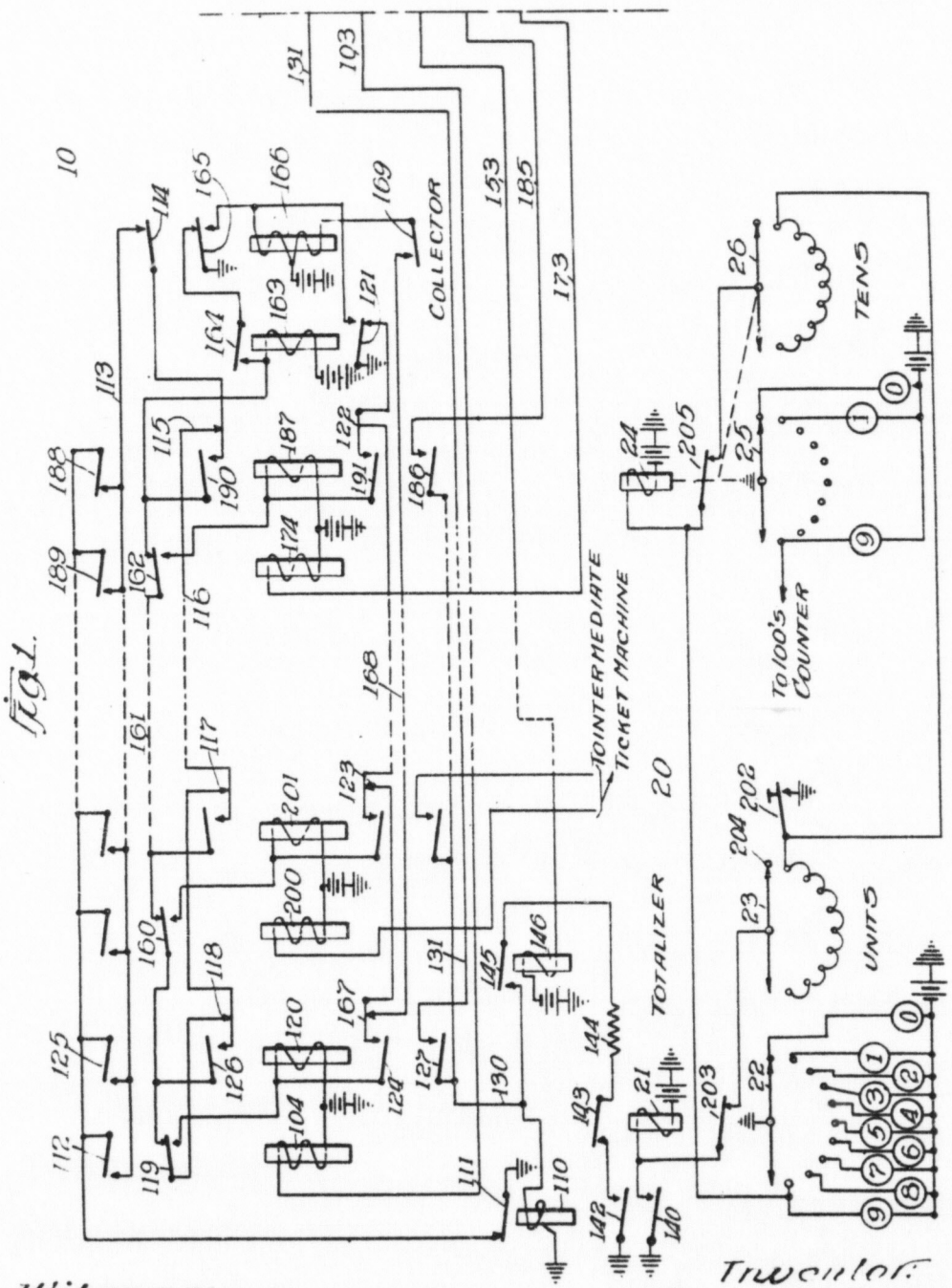


Fig. 1.

Witness:
Harry P. L. White

Inventor:
Oscar C. Levy
Arthur J. Johnston
By George H. Simmons
Atty.

A554

Nov. 14, 1939. O. C. LEVY ET AL 2,179,698

TOTALIZING SYSTEM

Filed Feb. 15, 1937 2 Sheets-Sheet 2

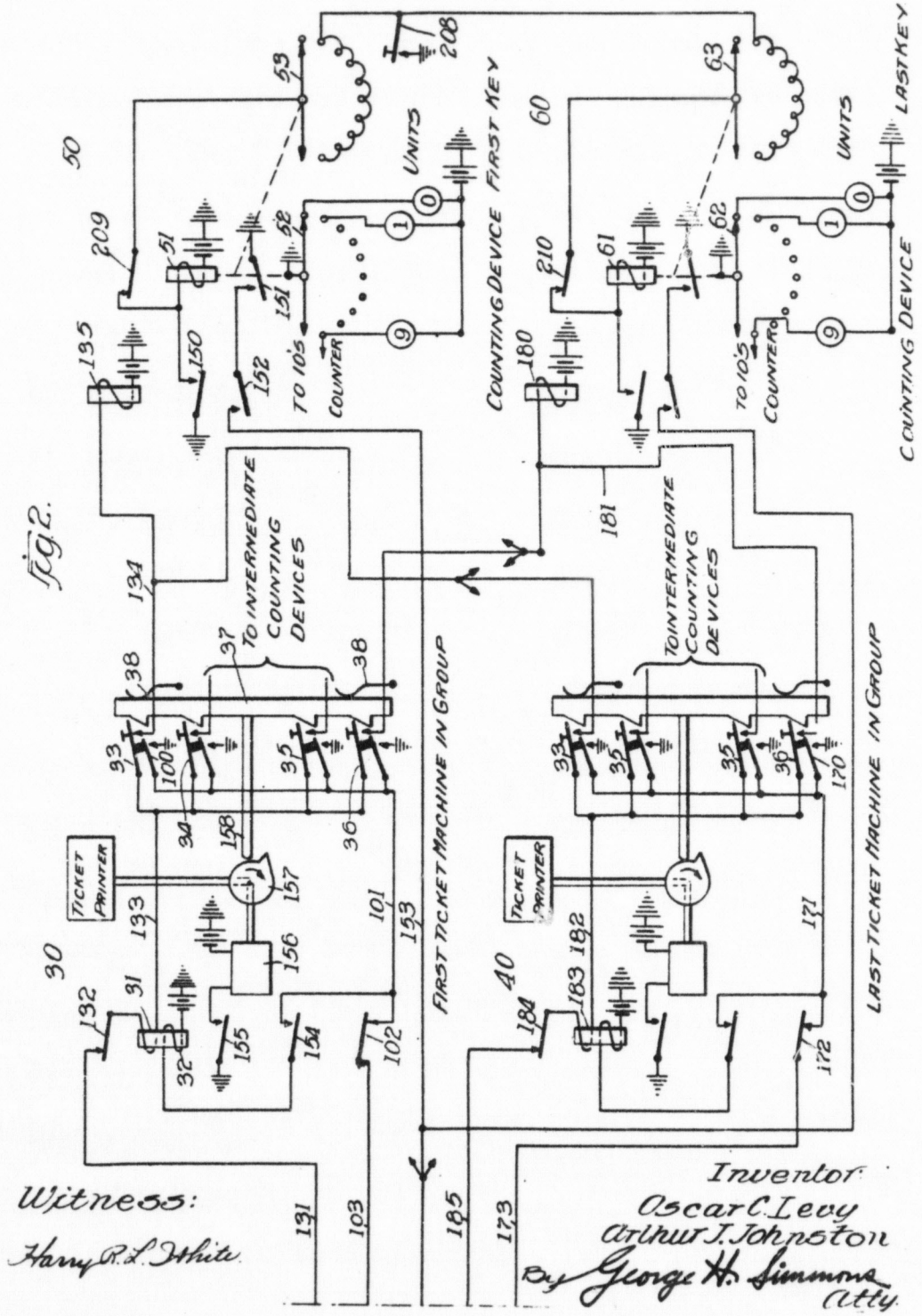


Fig 2.

Witness:
Harry R. L. White

Inventor
Oscar C. Levy
Arthur J. Johnston
By George H. Simmons
Atty

Patented Nov. 14, 1939 2,179,698

UNITED STATES PATENT OFFICE

2,179,698

TOTALIZING SYSTEM

Oscar C. Levy, Chicago, Ill., and Arthur J. Johnston, San Mateo, Calif., assignors to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application February 15, 1937, Serial No. 125,792

10 Claims. (Cl. 235—92)

This invention relates to totalizing systems and has for its principal object the provision of a new and improved system of this kind which is cheaper to build and maintain and is more rapid and more certain in its operation.

In a totalizing system of the kind to which this invention refers, there is provided an electrical device that is adapted to be momentarily connected to any one of a plurality of machines, through a collector and also there is provided a plurality of electrical devices adapted to be connected with the said one of said machines simultaneously with said first device by means independent of said collector, the two devices and machines being controlled over the connection thus formed in an inter-related operation.

The present invention relates particularly to the collector for systems of this kind and provides as a main object a direct acting collector operating to connect the device with a selected machine without performing a searching operation.

It is a further object of the invention to provide a direct acting collector that is locked in connecting position until the devices and machine have performed certain operations which effect a release of the collector.

Another object of the invention provides a direct acting collector arranged to connect the electrical device to the machines one at a time in definite sequential order in the event of a simultaneous operation of two or more of the machines.

Still another object of the invention provides a direct acting collector equipped to restore itself to a normal position after each single operation and after the last one of a plurality of operations simultaneously initiated.

Further objects of the invention not specifically mentioned here will be apparent to one skilled in the art from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

Figure 1 is a schematic wiring diagram of a collector and its associated electrical device; and,

Figure 2 is a schematic wiring diagram of the electrical machines and associated apparatus.

Totalizing systems of the kind to which the present invention refers are frequently used in connection with ticket machines that have a plurality of keys and are adapted to print and issue a ticket corresponding to an actuated key. The system includes individual adding machines associated with the ticket machines and connected thereto one at a time by the actuation of a key therein and arranged to count the total number of tickets, of the denomination corresponding to the key, issued by the machine. The system also includes a total adding machine adapted to be connected to any one of the ticket machines by a collector and to count the total number of tickets of all kinds issued by the machines. In an installation of this kind twenty-five or more ticket machines may be grouped together in one group and be made available to the total adding machine by the collector, and each machine may have as many as 40 keys in which case there will be provided 40 individual adding machines adapted to be associated with a corresponding key of each of the ticket machines independently of the collector.

Referring now to the drawings more in detail, we have shown a collector indicated generally at 10 and comprising a plurality of relays including a pair of relays for each ticket machine with which the collector is adapted to establish a connection. Figure 1 also shows a total adding machine indicated generally at 20 and comprising a stepping switch, indicator means and associated control relays.

Figure 2 shows a ticket machine 30 bearing the legend, "First ticket machine in group", and a second and similar ticket machine 40, bearing the legend "Last ticket machine in group". Figure 2 also shows an individual adding machine 50, bearing the legend, "Counting device first key", and also shows a second individual adding machine 60, bearing the legend, "Counting device last key".

In Figures 1 and 2 there are shown a plurality of batteries, as is the custom in schematic wiring diagrams. In an installation of the system, there will be but one battery ordinarily, preferably of about 50 volts potential and having its positive pole grounded. If desired, the ticket machines may be operated from commercial current of about 110 volts potential, although the battery connection shown may well be used.

As shown in the drawings, the total adding machine includes a stepping switch consisting of magnet 21, that is arranged to drive wipers 22 and 23 over their respective banks of contacts, and a second stepping switch consisting of magnet 24 that is arranged to drive wipers 25 and 26 over their respective banks of contacts. Stepping switches of this type are well-known to those skilled in the art and preferably are arranged so that the wipers are advanced upon de-energization of the magnet.

Switches 50 and 60 in the individual adding machines are of similar construction, switch 50 comprising a magnet 51 which is arranged to drive wipers 52 and 53 over their respective banks of contacts upon de-energization. Switch 60 comprises a magnet 61 which is arranged to drive wipers 62 and 63 over their respective banks of contacts. While stepping switches are shown, it will be appreciated by one skilled in the art that other counting means may be substituted within the teachings of the invention, such as, for example, a relay counting chain or a magnetically operated mechanical counting device.

The ticket machines 30 and 40 form no essential part of the present invention and are shown as examples of machines with which the collector may be conveniently used. The ticket machines per se are shown and described in Patents 1,886,626 and 1,886,627, issued to H. D. Black on November 8, 1932, to which patents reference is here made for the details of construction and operation of the machines.

That part of ticket machine 30 which pertains to the present invention consists of a control relay 31 having a low sensitivity winding and a locking winding 32. The machine is equipped with a plurality of keys consisting of main springs 33, 34, 35 and 36 and associated make contacts. A latching lever 37 is arranged to engage each one of the main springs 33 to 36 inclusive of the keys to hold it in operated position so that when once depressed, the key will remain locked until released by a subsequent operation of the machine, as will presently appear. The operation of the keys prepares the machine to issue a ticket of corresponding denomination, in the manner described in the foregoing patents, and initiates the operation of the device of the present invention in the following manner.

Assume that the first key 33 in ticket machine 30 is depressed to prepare that machine to issue a ticket of the number 1 denomination. Associated with and insulated from the key 33 is a main spring 100, which when operated into engagement with its grounded make contact, closes a circuit from the main spring over conductor 101 through the normally closed contacts 102 controlled by relay 31, conductor 103, through the winding of start relay 104 of the collector to battery, and relay 104 operates over this circuit. Relay 104, at springs 112, closes a circuit which may be traced from ground through the normally closed contact 111, controlled by relay 110, through springs 112, conductor 113, through normally closed contacts 114, normally closed contacts 115, conductor 116, normally closed contacts 117, normally closed contacts 118, through spring 119 of relay 104 and its make contact, through the winding of relay 120 to battery. Relay 120 operates over this circuit and locks itself in operated position over a circuit which may be traced from ground at normally closed contacts 121, over the chain circuit through normally closed contacts 122 and 123, through the make contact of and main spring 124, through the winding of relay 120 to battery.

The operation of relay 120 closes springs 125 without effect at this time. Relay 120 also closes springs 126, which operate to separate normally closed contacts 118 to break the previously traced circuit to spring 119, without effect at the moment for the reason that relay 120 is locked in operated position over a separate circuit. The operation of relay 120 closes main spring 127 against its make contact to establish a connection between the total adding machine 20 and the first ticket machine 30.

The connection between the total adding machine and ticket machine may be traced from ground through relay 110, conductor 130, through spring 127 and its make contact, conductor 131, through the normally closed contacts 132 controlled by relay 31 of the ticket machine 30, through to the upper winding of relay 31, conductor 133, through key 33 and its make contact, conductor 134, through the winding of control relay 135 of the stepping switch 50 to battery.

Relay 110 is a high sensitivity relay wound so as to have low inductance and as a consequence operates at high speed. As previously explained, the upper winding of relay 31 is a low sensitivity winding. Relay 135 is a high sensitivity relay wound to have an inductance greater than the inductance of relay 110. The current flowing into the above traced circuit through relays 110, 31 and 135, is sufficient to operate relays 110 and 135 but is insufficient to operate low sensitivity relay 31.

Relay 110 upon operating opens normally closed contacts 111 to remove ground from the chain extending through normally closed contacts 114, 115, 117 and 118 of the collector device, thereby to lock the collector against further operation at this time.

The operation of relay 110 operates the total adding machine in the following manner. At springs 140, relay 110 closes a circuit from ground through magnet 21 to battery, and the magnet operates to prepare to advance wipers 22 and 23 one step. With the total adding machine in the normal position in which it is shown in the drawings, a circuit may be traced in ground from wiper 22 through the zero indicating device at battery to actuate that device to indicate zero. The indicating devices, 10 in number and designated by numbers 0 to 9 inclusive, may be lamps provided with caps containing the numbers or may be any other of the preferred type of visual indicating devices. Upon subsequent de-energization of magnet 21, wipers 22 and 23 will be moved one step from their normal positions, and the circuit just traced to the zero indicating device will be broken and a circuit will be closed to the number 1 indicating device in lieu thereof. The indicator is thus caused to indicate number 1. Successive operations of the magnet steps the wiper 22 over its bank to light the indicators in consecutive order until the indicator 9 is energized, at which time, a parallel circuit may be traced from the ground through the number 9 contact engaged by wiper 22 through the winding of magnet 24 to battery, and magnet 24 is operated over this circuit preparatory to advancing wipers 25 and 26 one step. Thus when magnet 21 is again de-energized to extinguish the number 9 indicator, and to reoperate the number 0 indicator, magnet 24 will be simultaneously de-energized and wipers 25 and 26 advance to cause wiper 24 to de-energize the zero indicator and energize the number 1 indicator in lieu thereof, so that the totalizer indicating device will indicate "10". Three indicators are shown connected to the bank engaged by wiper 25, but it will be understood that ten indicators will be provided and that they will be connected in the same manner as in the units indicator.

Relay 110, upon energizing, closes springs 142 and magnet 21 upon energizing closes springs 143 to extend a circuit from ground through

those springs and the resistor 144 to the spring 145 of acknowledging relay 146. The circuit extends no farther at the moment for the reason that the acknowledging relay is not operated.

In the individual adding machine 50, Figure 2, the operation of relay 135 over the above traced circuit, closes springs 150, thereby to close a circuit through magnet 51 to operate that magnet preparatory to advancing wipers 52 and 53. Wiper 52 in its normal position closes a circuit through the zero indicator of the first key individual adding machine, which is the same as the total adding machine and need not be explained further herein. To avoid an unnecessary complication of the drawings, but 3 indicators are shown connected to the bank of contacts engaged by wiper 52, but it is to be understood that 10 indicators will be used and will be connected in the manner shown in Figure 1. The operation of magnet 51 closes springs 151 to extend a circuit from ground through this spring, through spring 152, which are closed by relay 135, over a conductor 153, through the winding of acknowledging relay 146 to battery, and relay 146 operates over this circuit.

The operation of relay 146 extends the previously traced circuit to ground through resistor 134 to spring 135 to conductor 130, and thence over the previously traced circuit extending thru the upper winding of relay 31 and relay 135 in series. The resistance of resistor 144 is less than the resistance of relay 110, and the closing of the above circuit in shunt of relay 110 increases the current flowing through the winding of low sensitivity relay 31, causing that relay to operate.

Relay 31 upon operating, locks itself over a circuit extending from the grounded start conductor 101, through springs 154 and the lower winding 32 of the relay to battery. Relay 31 opens normally closed contacts 132, thereby to break the previously traced circuit for relays 110 and 135 to permit those relays to de-energize. Relay 31 opens normally closed contacts 102 to remove ground from start conductor 103, thereby to cause start relay 104 to de-energize. Relay 31 closes spring 155 against its make contact to complete a circuit from ground through the motor 156 of the ticket machine to battery to operate that motor. The operation of the motor 156 causes the ticket machine to print and deliver a ticket of the denomination corresponding to key 33 in the manner set forth in the above mentioned patents, and rotates cam 157 in the direction indicated by the arrow to cause the hill of that cam to engage the push rod 158 and to move that rod to the right, Figure 2. Push rod 158 moves latching lever 37 to the right against the tension of springs 38 and releases key 33 to permit it and spring 100 controlled thereby to restore to their respective normal positions. Restoration of spring 100 removes ground from the locking conductor 101 thereby to break the circuit of locking wind 32 of relay 31, to permit that relay to de-energize and open the circuit of the motor 156 to stop the motor.

The de-energization of relay 135 operates the associated stepping switch causing it to complete the operation of counting the issuance of the ticket corresponding to key 33. The de-energization of relay 146 is without effect at this time.

The de-energization of relay 110 breaks the circuit of magnet 21 to permit the magnet to de-energize, and as explained above, to advance the switch wipers. The de-energization of relay 110 also re-closes spring 111 against its break contact, thereby to extend a circuit to the collector for the purpose of restoring the collector to normal, it being assumed at the moment that no other keys in any of the ticket machines are operated.

A circuit may now be traced from ground through normally closed contacts 111 through spring 125 and its make contact, conductor 113, over the previously traced chain through contacts 114 and 115, conductor 116, contact 117, through spring 126 and its make contact and thence through a chain of normally closed contacts extending through spring 160, conductor 161, spring 162, through the winding of release relay 163 to the battery. Relay 163 operates over this circuit and at springs 164, closes a locking circuit for itself which may be traced from ground through spring 165 and its break contact, spring 164, through winding of relay 163 to battery. The operation of relay 163 moves spring 121 from its break contact thereby to break the previously traced locking circuit over which relay 124 is maintained, to permit that relay to restore. Spring 121 moves into engagement with its make contact and closes a circuit from ground through the upper winding of relay 166 to battery, to operate relay 166. Relay 166 upon operating, opens contacts 114 to break the above mentioned chain circuit, and at spring 165, locks itself and breaks the locking circuit of relay 163.

As soon as relay 120 has restored and relay 163 has restored, a circuit may be traced from ground through spring 121 and its break contact, over the previously traced chain circuit through normally closed contacts 122 and 123, through normally closed contacts 167 controlled by spring 124 of relay 120, conductor 168, through spring 169 of relay 166 and its make contact, through the lower winding of relay 166 to battery. Relay 166 is differentially wound and when both windings are energized, the flux set up by one winding opposes the flux set up by the other winding and the relay restores to normal.

Restoration of relay 166 closes contacts 114 to close the chain circuit in readiness for the next operation.

From the foregoing it will be seen that the operation of a key in one of the ticket machines associates an individual adding machine with that ticket machine and closes a starting circuit to a start relay in the collector that is individual to the ticket machine, to preselect that particular machine, and prepares an operating circuit that extends through the total adding machine, ticket machine and individual adding machine, in series. The collector is operated to complete this circuit without performing a selecting or hunting operation, and is locked in operated position to maintain that circuit closed so long as the same is needed. The individual and total adding machines are each operated to jointly control the ticket machine to initiate an operation thereof, and the ticket machine operates to restore the total adding machine to normal and to initiate the restoration of the collector to normal. The collector operates to restore itself if there are no other ticket machine keys depressed at the moment.

Assume now that key 33 in ticket machine 30 is depressed to initiate the operations hereinabove described and that simultaneously key 36 in ticket machine 40 is depressed. Associated with key 36 is a spring 170 which upon being

operated, closes a circuit from ground to start conductor 171 through spring 172 and its break contact, conductor 173, through the winding of start relay 174 to battery, over which circuit start relay 174 is operated. Spring 36 upon being actuated prepares a point in a series circuit through relay 180 of the last key individual adding machine, conductor 181, conductor 182 through the upper winding of relay 183, springs 184, conductor 185 to the make contact engaged by spring 186 of collector relay 187, but since the collector relay is not yet energized this circuit is not completed.

Start relays 104 and 174 being simultaneously energized, the previously traced circuit from ground at contacts 111 through the normally closed contacts, controlled by the collector relays to the main spring 119 of start relays 104 is not interrupted by the operation of relay 174, and collector relay 120 is operated as before, and the hereinabove described operations are completed. Upon the de-energization of relay 110 responsive to the operation of relay 131 as explained above, a circuit may now be traced for relay 187 as follows: ground at springs 111, through spring 125 and its make contact, and thence over the previously traced circuit to normally closed contacts 117, thence through spring 126 and its make contact, spring 160 and its break contact, conductor 161, spring 162 and its make contact, through the winding of relay 187 to battery. Relay 187 operates over this circuit and closes springs 186 to extend the above traced circuit of relays 180 and 183 through conductor 130 and the winding of relay 110 to ground, thereby to establish the series circuit through those relays, to operate those relays in a manner identical to the previously explained operation of relays 110, 31 and 135. Relay 187 closes springs 188 which are in multiple with springs 189 on the start relay 174. Relay 187 also operates spring 190 which serves to break the previously traced chain circuit by opening normally closed contacts 115 and to close a substitute circuit to the reset relay 163. At springs 191, relay 187 locks itself to ground at spring 121 and its break contact, and by opening normally closed contacts 122, breaks the previously traced locking circuit for relay 120 to permit that relay to restore.

Relay 110 is operated over the series circuits through spring 186 to remove ground from the chain circuit and is subsequently restored to reapply ground thereto, with the result that the circuit of reset relay 163 is completed as before except that it is now extended through spring 190 and its make contact, whereupon relay 163 operates to operate relay 166 and reset the chain as before.

Upon the operation of relay 187 and subsequent restoration of ground to the chain by restoration of relay 110 reset relays 163 and 166 are operated even though other start relays in the chain may be operated at the moment. Thus it will be seen that in the case of a simultaneous operation of two or more start relays in the collector the start relay associated with the lowest number ticket machine of the group will be operated first, after which each other ticket machine will be picked up in consecutive order, and when the last ticket machine of the group is operated the reset mechanism is actuated to restore the collector to normal so that subsequent operations of the ticket machines will again be picked up in consecutive order.

Conductors 161 and 168 are indicated by dotted lines to indicate that the chain may be expanded to include other relays. As shown, relays 104 and 120 are associated with the first ticket machine of the group, relays 174 and 187 are associated with the last ticket machine in the group, and relays 200 and 201 are associated with an intermediate ticket machine, not shown. The number of ticket machines that can be handled by the collector device is virtually unlimited since the insertion of another ticket machine merely means the insertion of a few more contacts in the chain circuits through the device, and the number of ticket machines that can be grouped together is limited only by the capacity of the total adding machine to handle them and not by the capacity of the collector.

By the foregoing it will be seen that the collector restores itself to normal automatically if no additional ticket machines are to be picked up, the ticket machines restore themselves to normal automatically and in order to restore the total adding machine to normal, there is provided a key 202 which upon being closed, closes a circuit from ground to the contacts of the bank over which wiper 23 of the stepping switch 20 passes, closing the circuit through that wiper and spring 203 through the winding of magnet 21 to battery. The magnet energizes over this circuit to open springs 203 to break its own circuit, deenergize and advance the wipers. The magnet operates in a buzzer-like fashion until normal position contact 204 is engaged by wiper 23 at which time the circuit of the magnet remains open since this contact is not connected in the multiple with the other contacts. Key 202 also closes a similar circuit from ground to a bank of switch wiper 26 through normally closed contacts 205 controlled by the motor magnet 24 of that switch through the winding of that magnet to battery, and that magnet is operated in a buzzer-like manner to restore that switch to its normal position.

In the individual adding machine a similar restoring circuit is provided and consists of a restoring key 208 which upon being closed, grounds the contacts of switch 50 over which wiper 53 passes and then contacts of the bank of switch 60 over which wiper 63 passes. The circuit is extended through spring 209 through switch 50 through the winding of magnet thereof to operate that magnet in buzzer-like fashion to restore switch to normal. The ground picked up by wiper 63 is extended over the circuits through contacts 210 through magnet 61 to operate that magnet in buzzer-like manner to restore switch 60 to its normal position.

Having thus complied with the statutes and shown and described our invention by illustrating a preferred embodiment of it, what we consider new and desire to have protected by Letters Patent is pointed out in appended claims.

What is claimed is:

1. In a collector comprising a plurality of start relays and collector relays one of each for each device with which the collector is adapted to make connection, means for operating said relays in preferential order in the event of simultaneously initiated operations, comprising a chain circuit extending through contacts on said collector relays in one direction and then through contacts on said start relays in a reverse direction, means controlled by said collector relays for shunting a part of said chain, means including a second chain circuit extending through contacts on said collector relays in said reverse

direction for locking said collector relays in operated position, and means for releasing said collector relays at the end of the operation of the collector.

2. In a totalising system, a plurality of ticket machines, each having a plurality of keys, a totaliser, a collector comprising a start and a collector relay for each ticket machine, a plurality of counting devices, one for each of said keys, means responsive to the operation of a key in one of said ticket machines for operating the corresponding start relay, means responsive to the operation of said start relay for operating the corresponding collector relay to establish a connection to the ticket machine, means for locking said collector relay in operated position, means for connecting the counting device corresponding to the operated key to the ticket machine, and means controlled by the ticket machine for unlocking said collector relay and for restoring said counting device connecting means.

3. The combination with an electric device adapted to be connected to a plurality of electric machines one at a time and having a high speed control relay that is energized upon the completion of said connection, of a collector for establishing said connection having a normal position occupied when not in use and comprising, a start and a collector relay individual to each machine, means individual to each machine for closing a circuit to the start relay of the associated pair to operate the same, means controlled by said energized start relay for operating the collector relay of the pair over a circuit extending from normally closed contacts controlled by said high speed relay through a chain of normally closed contacts controlled by said pairs of relays, means controlled by said collector relay for establishing said connection, means for locking said collector relay in operated position, reset means common to said pairs of relays, means controlled jointly by said reset means and high speed relay and including a reset chain through said collector relays for restoring said collector to normal.

4. In combination, a plurality of electrical machines, an electrical device, a control relay in said device, a collector for connecting said device to said machines one at a time, comprising, a start relay for each machine, a collector relay for each machine, a chain circuit extending serially through normally closed contacts on said collector relays thence through normally closed contacts in said start relays thence in multiple through normally open contacts on said start and collector relays, means including contacts closed by said control relay in normal position for energizing said chain, means in each of said machines individual thereto for energizing the associated start relay to break said chain and divert the same to the associated collector relay to operate the same thereover, a locking circuit closed by said collector relay for holding the same operated, means controlled by said collector relay for establishing a connection between said device and machine over which said control relay is operated to open the normally closed contacts controlled thereby, reset relays in said collector, means controlled by said operated collector relay for extending said chain circuit around said operated start and collector relays to said reset relays, means in said machine for breaking said connection between the device and machine to restore the said relay and re-energize said chain to operate said reset relays, and means controlled by said reset relays for breaking the locking circuit for said collector relay.

5. In a direct acting collector for establishing connections between electrical machines and an electrical device one at a time, a start and a collector relay individual to each machine, means in the machine for operating the associated start relay, a reset relay, a chain circuit extending in series from normally open contacts on said start relays and then through normally closed contacts on said start and collector relays to said reset relay, means controlled by an energized start relay for applying ground to said chain and for diverting the chain to the collector relay associated with said start relay to energize said collector relay, means controlled by said energized collector relay for establishing a connection between said machine and device, for locking said relay energized and for by-passing said chain circuit around said start relay contacts to said reset relay, and means controlled by said reset relay for unlocking said collector relay and restoring said collector to normal.

6. The combination with a collector comprising pairs of relays with one relay of each pair adapted to be energized over a chain circuit selectively controlled by the other relay of the pair, of a reset means comprising a relay normally terminating said chain and adapted to be operated thereover, a differentially wound reset relay, means controlled by said first reset relay for locking itself in operated position, means controlled by said first relay for operating said differential relay through one winding to break the chain and the locking circuit of said first reset relay, and means controlled by said first relay over a chain through normally closed contacts on the other relays of said pairs of relays for energizing the other wind of said differential relay to restore said relay and said collector to normal.

7. The combination with a group of electrical machines, of an electrical device adapted to be connected to said machines one at a time, a relay in said device operable to effect an operation thereof, a collector, a plurality of start relays in said collector one for each of said machines, a plurality of switching relays in said collector one for each of said machines, a connection between said device relay and a contact on each of said switching relays, co-operating contacts on said switching relays each connected to the corresponding machine, a chain circuit controlled jointly by said start and switching relays, means on said device relay for applying potential to said chain, means in each machine for operating the associated start relay, means including said chain circuit for operating the switching relay associated with the operated start relay to connect said device to the selected machine, and means for operating said device relay over said connection to operate said potential applying means to remove potential from said chain.

8. In a totalizing system, a plurality of ticket machines, a plurality of keys in each machine operable to control the machine, a total adding machine for registering the transactions of said machine irrespective of the key that is operated to initiate the transaction, an individual adding machine multiplied into a corresponding key in each of said machines, a collector comprising two relays for each of said ticket machines, a relay in said total adding machine, means responsive to the operation of a key in one of said machines for connecting the associated indi-

vidual adding machine to said ticket machine, means also responsive to the operation of said key for operating the two collector relays associated with said ticket machine to connect the total adding machine to said machine, means for operating said total adding machine relay over said connection to maintain the connection, means in the ticket machine operated under the joint control of said individual adding machine and total adding machine for breaking said connection to restore said total adding machine relay, and means in the collector operated upon the restoration of said total adding machine relay for restoring the collector to normal.

9. The combination of a plurality of electrically controlled ticket issuing machines, key means in each machine operable to prepare that machine for operation to issue a ticket, a total adding machine adapted to be connected to said ticket machines to register the tickets issued thereby, a collector connected to said adding machine and adapted to connect the same to said ticket machines, said collector having a normal position occupied by said collector when not in use, means in the collector operated responsive to an operation of one of said key means to preselect the ticket machine containing said key means, means in the collector controlled jointly by said preselecting means and adding machine for establishing a connection between the total adding machine and the preselected ticket machine, means for locking the collector to maintain said connection, means controlled jointly by the ticket machine, total adding machine and collector for breaking said connection, and means in the collector for returning the same to normal.

10. In combination, a group of electric machines arranged in a definite sequential order, means in each machine for preparing the same for operation, an electrical device, a collector connected to said device and having a normal position occupied when not in use, said collector comprising a start relay and a collector relay for each of said machines, means responsive to an operation of the preparing means of a machine for operating the start relay associated with that machine, a release relay in said collector, a normally open chain circuit extending from said release relay through contacts on said start relays in one order and thence through contacts on said collector relays in a reverse order, means including contacts closed by the operations of said start relays for closing said chain circuit, said collector relays being operated over said chain circuit to move the collector from normal in one step over intervening non-prepared machines to the first prepared machine to establish a connection therewith and then to break that connection by moving in one step over intervening non-prepared machines to the next higher prepared machine to establish a connection therewith, and means for operating said release relay to return said collector to normal after a connection has been established to the highest order prepared machine.

OSCAR C. LEVY.
ARTHUR J. JOHNSTON.

June 19, 1951 M. R. KLEIN 2,557,384

TOTALIZATOR

Filed Dec. 10, 1945 4 Sheets-Sheet 1

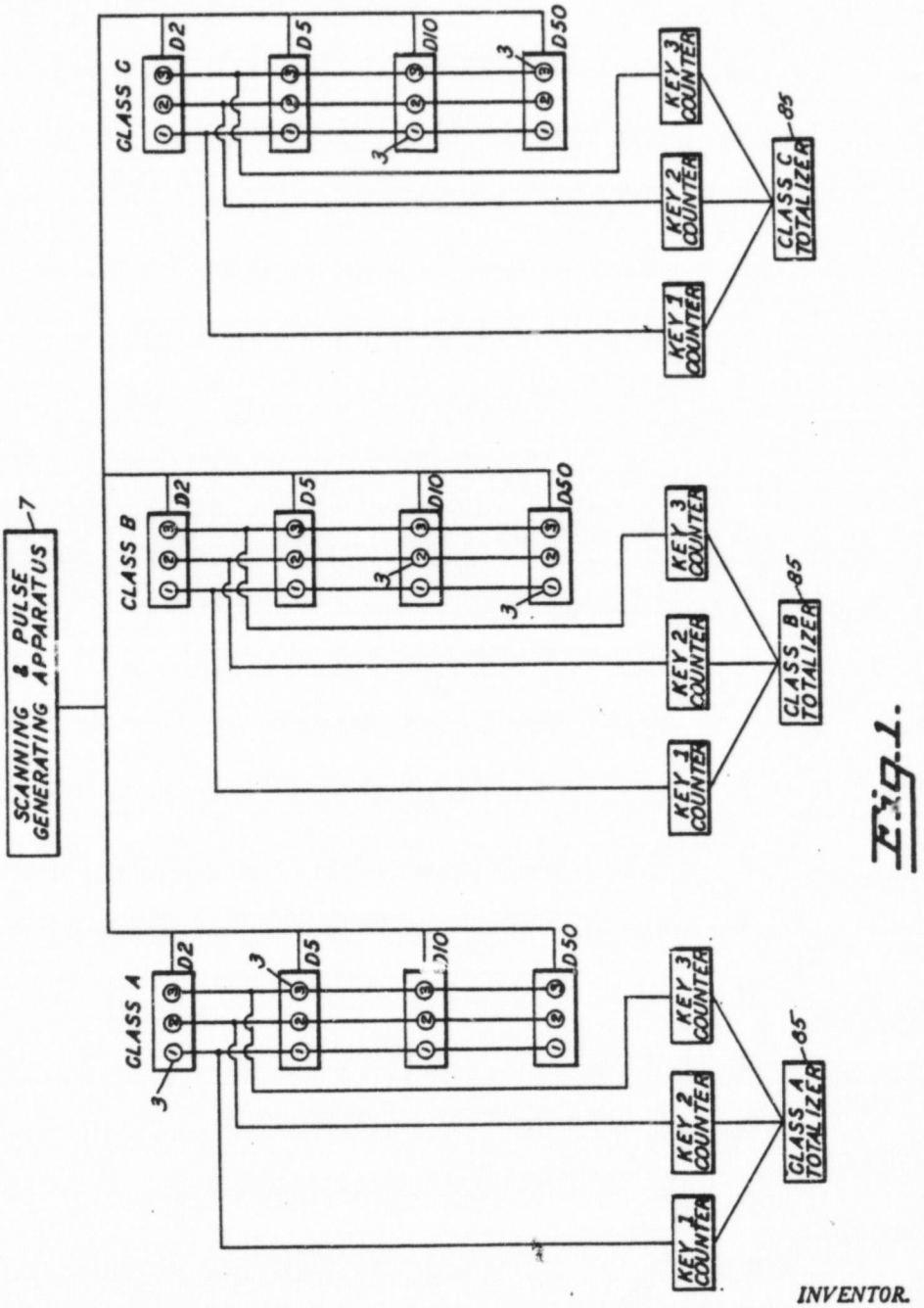


Fig. 1.

INVENTOR.
MICHAEL R. KLEIN
BY
Lippincott & Metcalf

A562

June 19, 1951 M. R. KLEIN 2,557,384

TOTALIZATOR

Filed Dec. 10, 1945 4 Sheets-Sheet 2

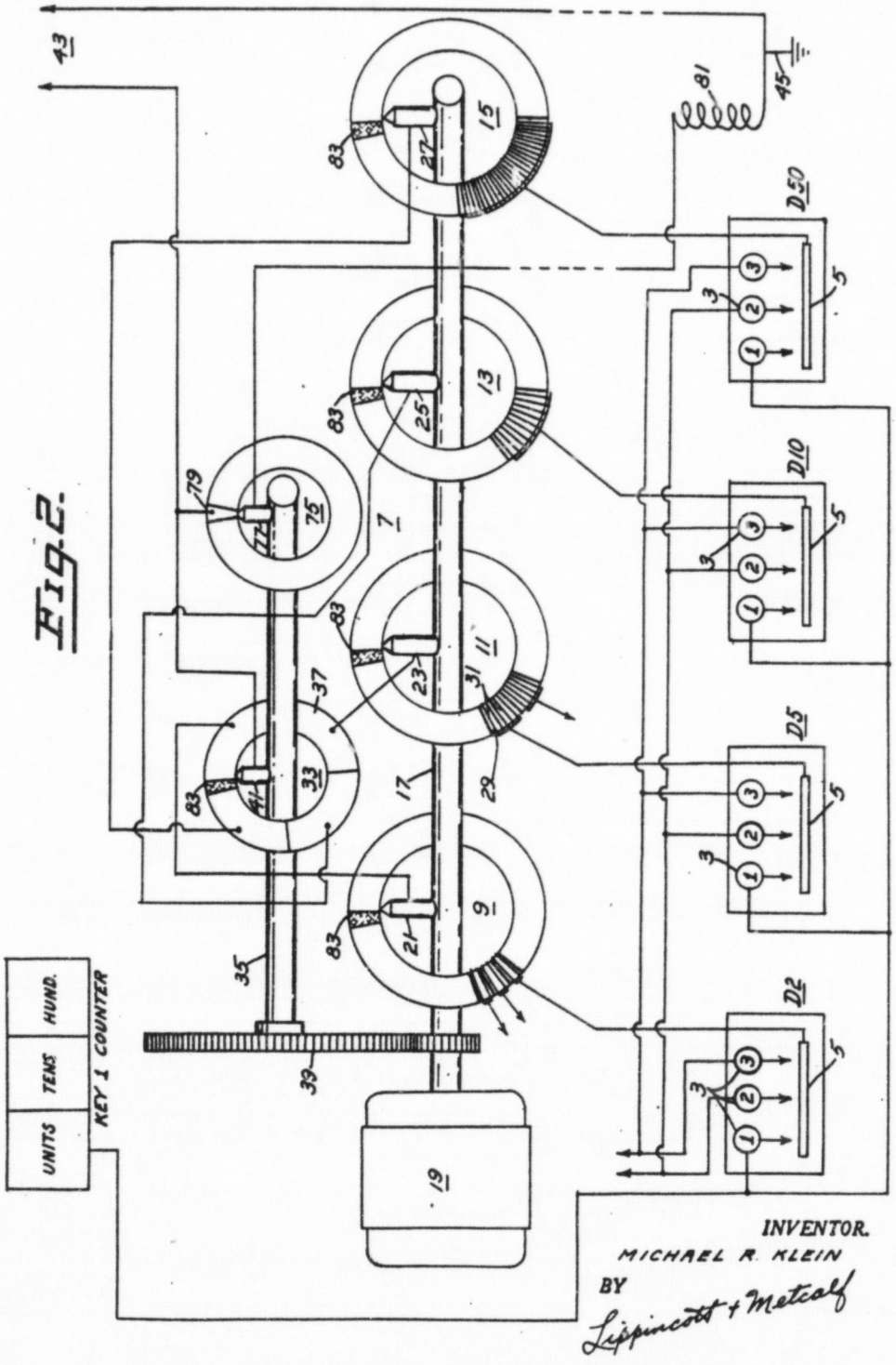


Fig. 2.

INVENTOR.
MICHAEL R. KLEIN
BY
Lippincott + Metcalf

there are suitable machines available on the open

lay 134 being a low sensitivity relay will not op-

June 19, 1951 M. R. KLEIN 2,557,384

TOTALIZATOR

Filed Dec. 10, 1945 4 Sheets-Sheet 3

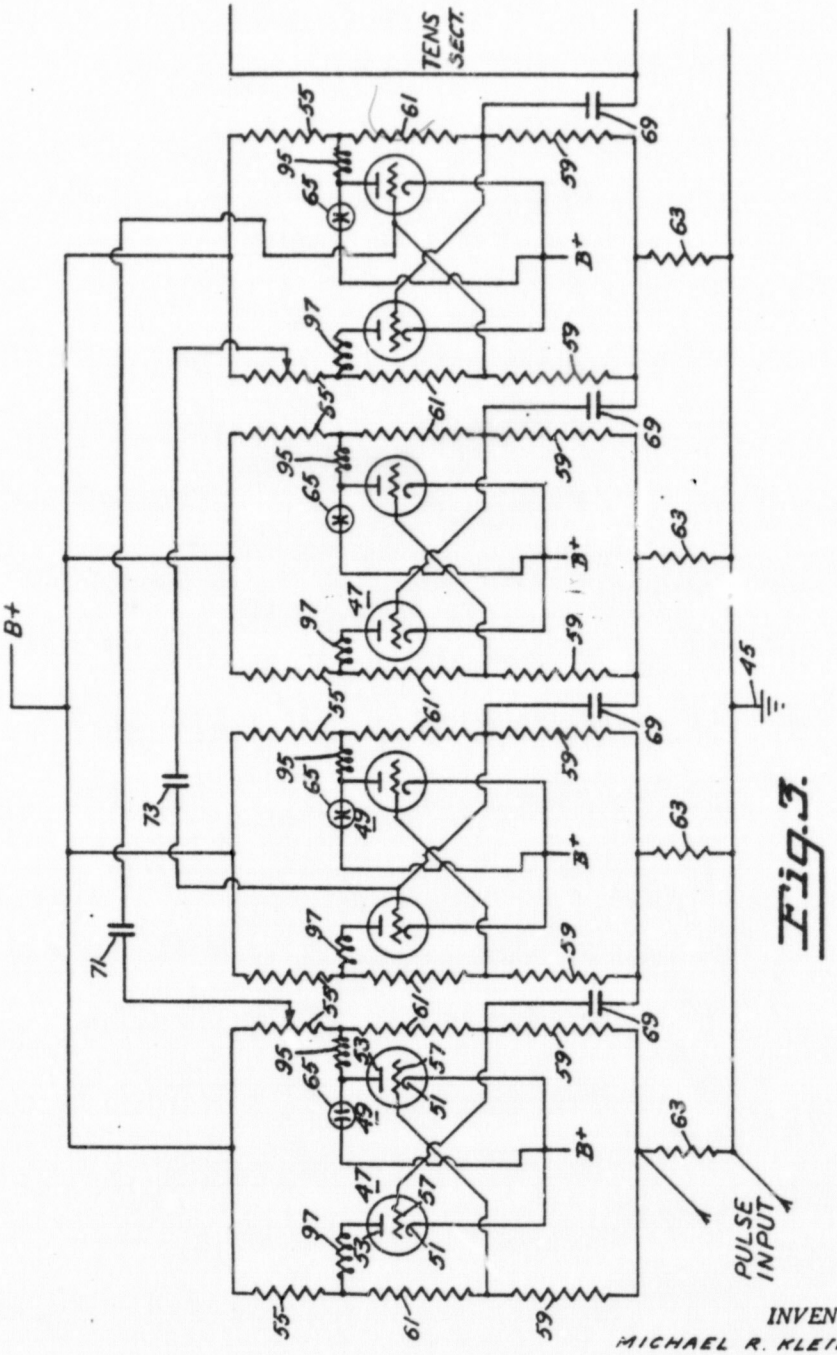


Fig. 3.

INVENTOR.
MICHAEL R. KLEIN
BY
Lippincott + Metcalf

A564

June 19, 1951 M. R. KLEIN 2,557,384

TOTALIZATOR

Filed Dec. 10, 1945 4 Sheets-Sheet 4

Fig. 4.

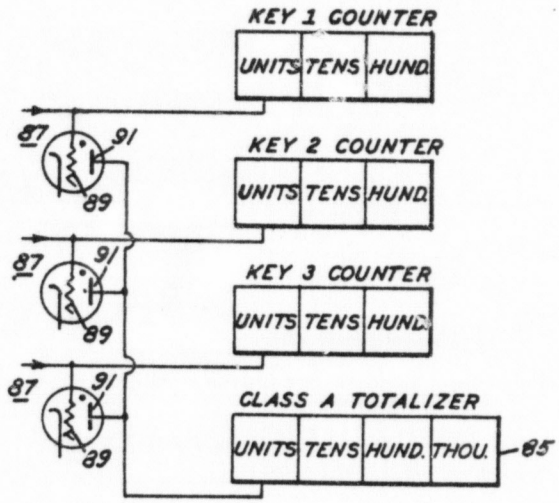
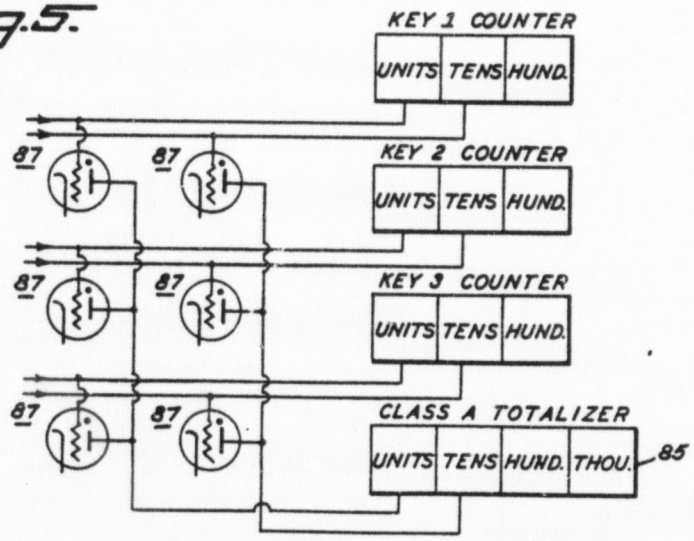


Fig. 5.



INVENTOR.
MICHAEL R. KLEIN
BY
Lippincott + Metcalf

Patented June 19, 1951 2,557,384

UNITED STATES PATENT OFFICE

2,557,384

TOTALIZATOR

Michael R. Klein, South San Francisco, Calif., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application December 10, 1945, Serial No. 634,031

5 Claims. (Cl. 235—92)

1

My invention relates to totalizers and more particularly to such apparatus for totalling the value of tickets for example, issued from a number of ticket dispensing machines of differing denominations.

In systems of the type to which my invention pertains, a plurality of ticket dispensing machines of differing denominations are provided, each machine having a plurality of numbered actuating keys but adapted to issue tickets of a single denomination only and relating to a particular class. It is very desirable in such system, to know at any instant, the total value of all tickets of a particular class, which have been issued through the actuation of keys of a particular number in a group of machines representing a certain class, also the total value of all tickets of a particular class regardless of key numbers.

A ticket dispensing machine of the type referred to and capable of use in the system of the present invention, is disclosed in and covered by Patents No. 1,732,078, 1,732,079, 1,733,716, 1,815,534, 1,862,446, 1,886,626, 1,886,627, 1,886,769, 1,900,092, 1,994,030, 2,020,594, 2,046,742, 2,115,760, 2,210,729.

Prior art systems for this purpose utilize totalizers in which stepping relays play a major part in the performance thereof. It has been found that in such systems, the rapidity of totalizing has for its limiting factor, the speed with which such relays can be made to function.

The ultimate to be hoped for in a totalizing system is that the information must be recorded within the shortest expected time interval between successive depressions of keys on any machine, and regardless of the number of such machines in use in the system. Since the demand on a machine at times may be so great that the shortest expected time interval will be measured by the maximum speed with which an operator can successively depress the keys of a machine, circuits depending for their operation on stepping relays cannot function quickly enough to meet such possible demand upon them.

Among the objects of my invention are:

(1) To provide a novel and improved totalizer system employing no stepping relay circuits;

(2) To provide a novel and improved totalizer system in which the human element is a speed limiting factor in its operation, whereby an operator cannot possibly exceed the ability of the system to keep up with him;

(3) To provide a novel and improved totalizer system of reduced size and weight as compared to prior systems;

2

(4) To provide a novel and improved system of great simplicity and ruggedness, and one which readily lends itself to servicing if and when necessary.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings wherein—

Figure 1 is a block diagram of the system of my invention;

Figure 2 is a schematic showing of the scanning and impulse generating apparatus embodied in my system;

Figure 3 is an electronic decade counter circuit forming part of the system combination;

Figure 4 is a view illustrating the manner of totalizing the information transmitted to a plurality of decade counters, when all pulses are of unit value;

Figure 5 is a corresponding view when certain of the pulses have a value of ten.

Referring to Figure 1 of the drawings for a broad view of the system embodying my invention, it will be noted that the machines are divided into groups, each group representing a particular class such as Class A, Class B, . . . etc., and comprising a number of machines of differing denominations, designated as D2, D5, . . . etc., with enough machines of any one denomination sufficient to handle the anticipated demand for tickets of such denomination.

Each machine is capable of being actuated into operation through the depression of any one of a plurality of numbered keys 3 with which such machine is provided. The depression of any one of such keys will cause the machine to issue a ticket but, regardless of which key is depressed, the denomination of the ticket will be the same and will correspond with the denominational value of the machine from which the ticket is dispensed.

To evaluate all the tickets of a particular class dispensed by the corresponding keys of the various machines of such class, a counter for all the corresponding numbered keys of each group is provided, whereby the depression of any one or more of similarly numbered keys in a group will condition their associated machines for the transmission of information to the counter. Thus the counter which is associated with the number one keys of one class group, for example, will receive information by way of those machines of this group in which the number one keys have been depressed. By scanning all the machines in

sequence, the information may be transmitted to associated counters and recorded.

The depression of a key merely conditions its associated machine for the transmission of information to the pertinent counter. The source of information is a pulse generator which transmits through each machine so conditioned, pulses corresponding to the denomination of such machine. In this manner, the pertinent counter will record the denominational value of the ticket issued from such machine.

For a detailed description of a preferred embodiment of my invention, reference will be made to the Figures 2 and 3 of my drawings wherein only machines of one class group are depicted, and for purposes of further simplification, only one machine of each denomination is considered in such group.

The machine may be of any conventional type of ticket dispensing machine having a plurality of numbered keys, each capable of conditioning the machine for printing and dispensing a ticket of the denomination assigned to such machine. Such machine, after being conditioned by the depression of the key, is preferably one which is caused to operate through a time cycle within which cycle, the ticket is printed and the key reset. For totalizing purposes, each key of a machine is individually connected in circuit to a separate counter designated in the drawings as key 1 counter, key 2 counter, . . . etc., with which it is to be associated, and upon being depressed, makes contact with a contact bar 5 for the duration of the operating cycle of the machine, that is until the key is reset following the printing and dispensing of the ticket.

The key 1, key 2, . . . etc. counters of a particular class are in turn coupled to a totalizer, designated in the drawings as Class A totalizer, Class B totalizer, . . . etc.

In conjunction with the above, I have provided a scanning and pulse generating apparatus 7 capable of sequentially scanning all machines within the brief period of a machine operating cycle, and transmitting the desired information to the pertinent counter apparatus; and in cooperation therewith the counter apparatus must be capable of recording such information during such brief scanning cycle.

Where the type of machine employed is one operating on a time cycle of operation, as is assumed to be the case here, synchronization of operation of all machines in proper time relationship with the scanning and pulse generating apparatus is essential toward full realization of the results desired.

The particular scanning and pulse generating apparatus illustrated by me (Figure 2) comprises a plurality of stationary pulse commutators 9, 11, 13, 15, . . . etc. in alignment about a shaft 17 driven by a motor 19 and carrying a corresponding brush 21, 23, 25, 27, . . . etc. for each commutator.

Each pulse commutator for simplicity of design and construction, is preferably associated with the machines of a particular denomination only, regardless of class represented thereby, and is made up of a number of segments 29 of insulation material in accordance with the expected number of machines of such denomination to be incorporated in the system. Each of the insulating segments carries radial contacts 31 representing the denominational value of the associated machines, such contacts being connected in parallel to the contact bar 5 of such machine. Thus the pulse commutator 9, which may for example, be associated with machines of a denominational value of two, may have a large number of insulation segments, with each segment carrying two contacts.

The second pulse commutator 11, which may be associated with machines of a denominational value of five, for example, will in all probability have a lesser number of insulation segments, but each segmeent in this instance will have five contacts connected in parallel to the contact bar of an associated machine.

Likewise, with the remaining pulse commutators of higher denominational value, each segment of insulation may be provided with a number of contacts in accordance with such denominational value, such contacts being connected in parallel to their associated machine, though it will later be shown how the number of these contacts may be reduced to a single contact per segment in machines of a denominational value of ten, and correspondingly reduced for machines based on multiples thereof.

For each revolution of the motor shaft 17, each brush will simultaneously wipe all contacts on its associated commutator, but since this would produce overlapping pulses in the system, it becomes necessary to transmit such pulses in timed sequence, and for this purpose, I provide a timing commutator 33 associated with an independent shaft 35, such commutator having as many conductive segments 37 as there are pulse commutators. A connection from each conductive segment to a different one of the pulse commutator brushes assures sequential connection of each pulse commutator in the system, whereby overlapping of pulses is definitely avoided.

The timing commutator shaft is driven from the pulse commutator shaft through a reduction gear 39, the ratio of reduction being equal to the number of segments in the timing commutator.

A brush 41 on the timing commutator shaft is connected to one side of a power source 43, the other side of which may be connected through ground 45 or wire connection to the various counters, to complete circuits thereto as will subsequently be discussed in greater detail.

It will be apparent from the above, that the pulse commutators, while they are in continuous rotation, will be connected in circuit sequentially due to the sequential application of power to each of the segments of the timing commutator.

It must be borne in mind, that while the timing commutator runs at a slower speed than the pulse commutators, it is this timing commutator which determines the cyclic scanning period. Since it is this period which should be shorter than any expected time interval between successive depressions of the keys of any one machine, then the timing commutator must execute each rotation within such period.

As previously indicated, corresponding keys of machines representing a particular class are connected to the same decade counter whereby all impulses transmitted by reason of the depression of these keys will reach this particular counter.

One form of such counter, capable of handling the maximum possible number of pulses in the short cycle time under consideration, as would be represented by the simultaneous depression of all like numbered keys in the machine representing a particular class, is that illustrated by me in the drawings. This counter has been

based on a trigger circuit known in the art as the Eccles-Jordan trigger circuit. Such trigger circuit is described on pages 353-356 of Theory and Application of Electronic Tubes, second edition by Herbert J. Rich.

Briefly such trigger circuit, in the form illustrated in the drawings, comprises a pair of triodes 47 and 49 with the filaments 51 connected together to a supply source B+ and the plates 53 connected to a point of higher positive potential on the same power supply source through load resistors 55. The grids 57 of the tubes are connected to the ground connection 45 through resistors 59.

A characteristic of such circuit, lies in the fact that each grid, also, is connected to the anode the other triode through a coupling resistor 61. When so connected, a slight unbalance in the current flow through one tube, if in the direction of increase for example, will increase the voltage drop in the coupling resistor to the grid of the other tube, making such grid more negative and thus decreasing the current flow in such other tube. This in turn decreases the bias on the first triode, resulting in a further increase of current therethrough. The action is cumulative and so one plate current rises while the other falls to zero.

The initial slight unbalance necessary to cause such operation may be realized by the application of a pulse across a resistor 63 in the common ground lead connection to the grids for example. In the particular system under consideration, such pulse will be one of those developed by the pulse commutators previously described. This is accomplished by parallel connections from the upper end of the resistor to the pertinent keys. The lower end of the resistor being grounded, the circuit is complete through the power source to the timing commutator.

The counter illustrated is made up of a number of stages, each of which embodies one of such aforementioned trigger circuits, to which has been added a signal device 65 such as a neon lamp between the plate and filament of the triode 49.

The first four stages are coupled to represent the units designation of the counter, while the next four stages are similarly coupled to register the tens designation, etc. To do this, each stage is capacitively coupled to the succeeding stage by a condenser 69 connected between one of the grids of the preceding stage and the common connection of the two grids of the following stage. Along with this, a condenser 71 is connected between a point on the load resistor of the first stage tube 49 and the grid of the corresponding tube of the fourth stage, while another condenser 73 is connected between the grid of the second stage tube 47 and the load resistor of the corresponding tube of the fourth stage.

When so coupled, the four stages in the units group may be assigned number values of 1, 2, and 8 respectively, and these values enable one to register any number from one to nine inclusive through the use of the lamps associated with the various stages. Thus, the first pulse will light the lamp in the first stage. The second pulse will extinguish this lamp and light the lamp in stage number two, which has the value two. The third pulse will reestablish lamp number one without extinguishing the lamp number two, thereby totaling to a value three. The fourth pulse will extinguish lamps of value one and two and light the lamp of the third stage which has been assigned the value four. The next pulse will light the lamp having the value one without extinguishing the lamp of value four, thereby totaling five.

Upon receipt of pulse number six, the lamp of value one will go out while the lamp of value two will go on, leaving lamp of value four burning, thereby designating a total of six. The next pulse will light lamp of value one without extinguishing the lamps of values two and four, thus totaling seven. The eighth pulse will cause the lamp of value eight to light and all the others in the group to be extinguished. The next incoming pulse will add the lamp of value one to give a total of nine.

Upon receipt of the tenth pulse, the presence of condensers 71 and 73 will reset the units group by extinguishing lights one and eight, and the first lamp of the second group will go on. If the lamps of the second group are assigned values ten times those of the corresponding lamps in the first group, and those of the succeeding groups, values ten times those of the preceding group, the ability of the counter to total pulses may be extended to any desired limit.

To assure synchronous operation of the machines, a single contact fixed commutator 75 is associated with the timing commutator shaft on which an associated brush 77 is mounted. The single contact 79 covers an arc of approximately ten degrees and serves momentarily to close a circuit through a motor starting solenoid 81, once every cycle of operation of the scanning and pulse generating apparatus.

Each conventional machine of the type considered in connection with the present disclosure, includes a holding circuit or mechanism which continues the machine functioning for its complete cycle of operation, once such machine has been energized by the motor starting solenoid circuit. Such holding circuit or mechanism is not part of the present invention except to the extent of the time relationship which it bears to the scanning cycle of the system.

For efficient synchronizing purposes, a brief period of quiescence should prevail between successive functioning periods of the machines to enable all machines to get set for their next cycle of operation. The timing and pulse commutators are each accordingly provided with a segment 83 of insulation occupying corresponding angular positions thereon just in advance of the contact 79 of the synchronizing commutator, in point of time, whereby all scanning and pulse circuits will be open and maintained so during the brief time interval consumed by the passage of the various brushes over these segments.

It might be in order at this time to stress the shortness of the periods involved in the aforementioned operation of my improved system. Assuming an operator, at times, can punch out two tickets a second, this means that the cycle period of the system as measured by a complete rotation of the timing commutator must be within one-half second, and the actual totalizing period per cycle will be still shorter by an amount as measured by the aforementioned quiescent period, which may be of the order of one seventy-fifth of a second.

It is apparent from the above description of my system, that the same will fulfill the objects of my invention. It is a relatively simple matter through the utilization of my commutator arrangement, to physically scan the machines and transmit the necessary pulses within the brief

cycle time allotted, and the cooperation therewith of an electronic counter as illustrated and described, permits of the recording or totaling of transmitted pulses practically instantaneously.

As indicated in Figure 1, it is not only desirable in a system of the type described, to evaluate the tickets dispensed by correspondingly numbered keys of a particular class, but also to evaluate all of the tickets dispensed from all of the machines of such class and record the same on a counter 85 which may for convenience be termed a totalizer. This I am able to accomplish in a very simple and effective manner by associating with each counter, an electron tube 87, preferably one of the thyratron type, with the grid 89 thereof connected to the pulse circuit, whereby the same electrical pulses transmitted to a particular counter will be impressed upon the grid of such tube for triggering the same. By connecting the plates 91 of all such thyratrons in parallel and feeding the output from such devices to the units division of the totalizer assigned to that particular class, all the counters of that class will be totalled. It is understood of course that each class group of counters will be similarly totalled.

While I have disclosed one embodiment of my invention in detail, the same is subject to modification and alteration without departing from the underlying principles thereof.

As one possiblity, the timing commutator and pulse commutator may be combined into a single commutator having sufficient segments of insulation to accommodate the total number of machines in the system. In this case, each segment will carry the proper number of contacts for the machine to which those contacts are connected. The time of each brush revolution will in this case be within the desired cycle time.

The pulse commutators might well be formed of a complete ring of insulation with the radial contacts inserted at properly spaced points. The term "segments" as previously utilized in describing these commutators should therefore be given sufficiently broad interpretation to cover this latter construction, which may be considered as comprising phantom segments or sections.

In lieu of the commutator construction previously described, a plurality of coils may be utilized for connection to the various counters, the pulses being induced therein by the rotation of an electro-magnet past such coils.

Also in the way of further possible modifications, the pulse commutator segments pertinent to machines of a value of ten or multiples thereof, need have but one-tenth the number of contacts previously indicated. However, when this reduced in number, the keys of these machines must be connected directly to the pertinent tens section of the counters, instead of running the pulses from these machines through the units counters, as previously described.

When, however, certain of these pulses have a value of ten in accordance with the foregoing modification, the unit pulses will be totalized in the same manner as previously described in connection with Figure 4, but as illustrated in Figure 5, the pulses having a value ten, must be totalized independently by way of a similar arrangement of thyratrons, whose grids are connected to that portion of the pulse circuits leading to the tens sections of the various counters. The output of such arrangement will then lead directly into the tens section of the totalizer for the particular class being totalled.

Likewise, should the system be enlarged to the point where certain of the pulses may be given a value of a hundred, then a third set of thyratrons for assembling these pulses from hundreds division of the various counters in a particular class and feeding the same into the hundreds section of the totalizer for such class, will be required.

Although the plates of the various thyratrons of any particular arrangement are connected in parallel, no confusion in the matter of registering pulses can result since the pulses applied to the grids of such tubes are time spaced from each other due to the commutator pulsing apparatus previously described.

In addition to or in lieu of the lamps utilized in the counters, relays 95 may be added in the plate circuits of the same tubes, and these relays will be assigned the same values as the lamps with which they may be associated. By cooperating these relays in accordance with their values, signals may be actuated which require no interpretation.

Corresponding impedances 97 will be added in the plate circuits of the companion tubes to maintain circuit symmetry.

Accordingly, while I have described one form of my invention in considerable detail, I do not desire to be limited in my protection thereto except as may be necessitated by the appended claims.

I claim:

1. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuable keys representing different items, for operating such machines to issue tickets therefrom, and registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of a ticket dispensed by actuation of such key, said pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

2. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuable keys representing different items, for operating such machines to issue tickets therefrom, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in

A569

accordance with the denomination of the ticket issued by each such machine.

3. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuable keys representing different items, for operating such machines to issue tickets therefrom, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for cyclicly scanning said machines in sequence and during such scanning, transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said scanning and pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

4. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuable keys representing different items, for operating such machines, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for cyclicly scanning said machines in sequence and during such scanning, transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said scanning and pulse transmitting means including a stationary cylindrical commutator of a plurality of sections of insulation and a brush rotatably mounted within the same, each section having a plurality of radial contacts therein, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

5. In a totalizing system involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuable keys representing different items, for operating such machines to issue tickets therefrom, and registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of a ticket dispensed by actuation of such key, said pulse transmitting means including a commutator of a plurality of sections, each section having a fixed number of pulse generating elements indicative of a ticket denomination, and means parallel connecting the pulse generating elements of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

MICHAEL R. KLEIN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,340,435	Bryce	May 18, 1920
1,872,370	Waite	Aug. 16, 1932
2,329,048	Hullegard	Sept. 7, 1943
2,332,756	Robinson	Oct. 26, 1943

FOREIGN PATENTS

Number	Country	Date
337,775	Great Britain	Oct. 30, 1930

A570

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 1

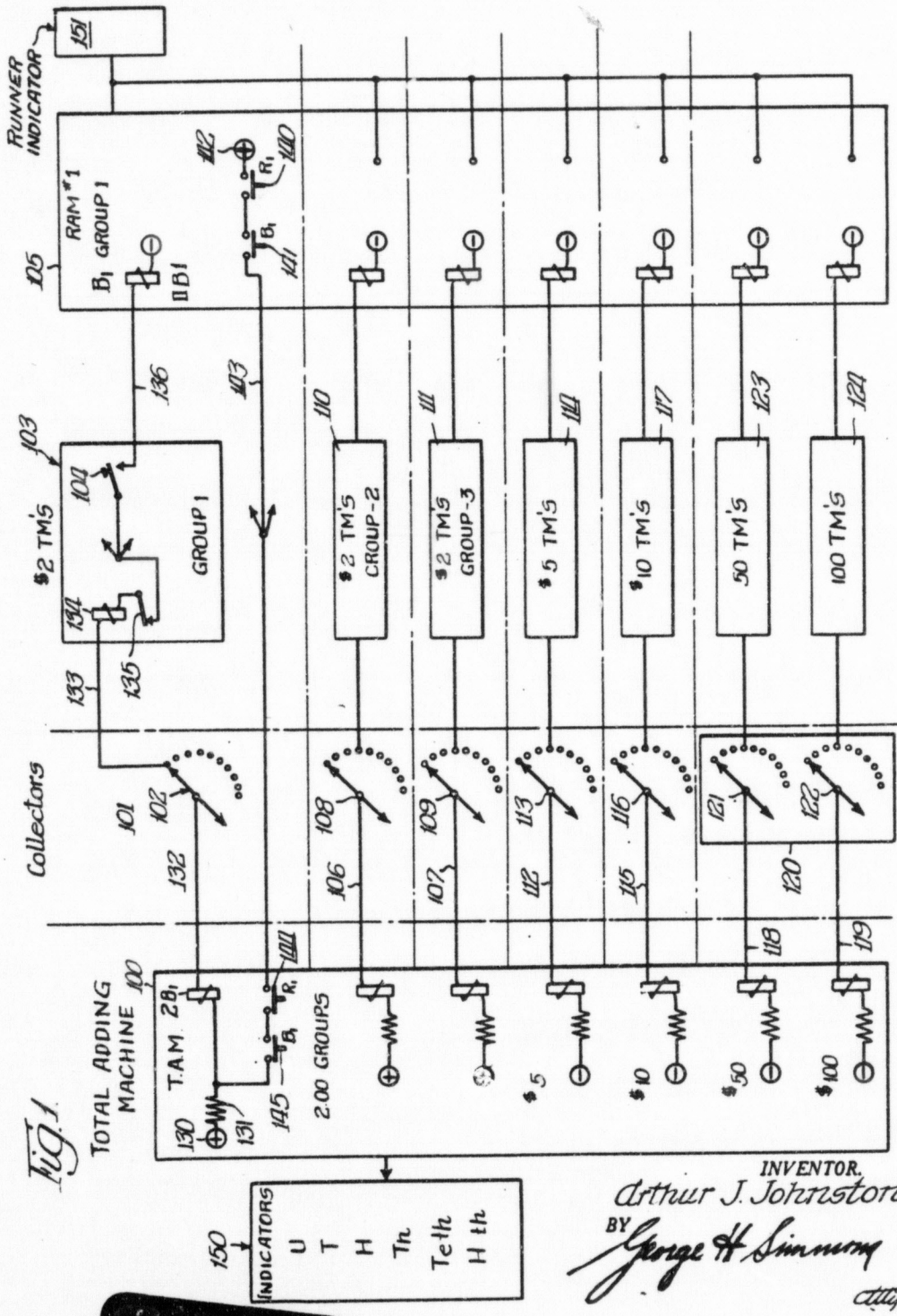


Fig. 1.

INVENTOR.
Arthur J. Johnston.
BY George H. Simmons
Atty.

[redacted]

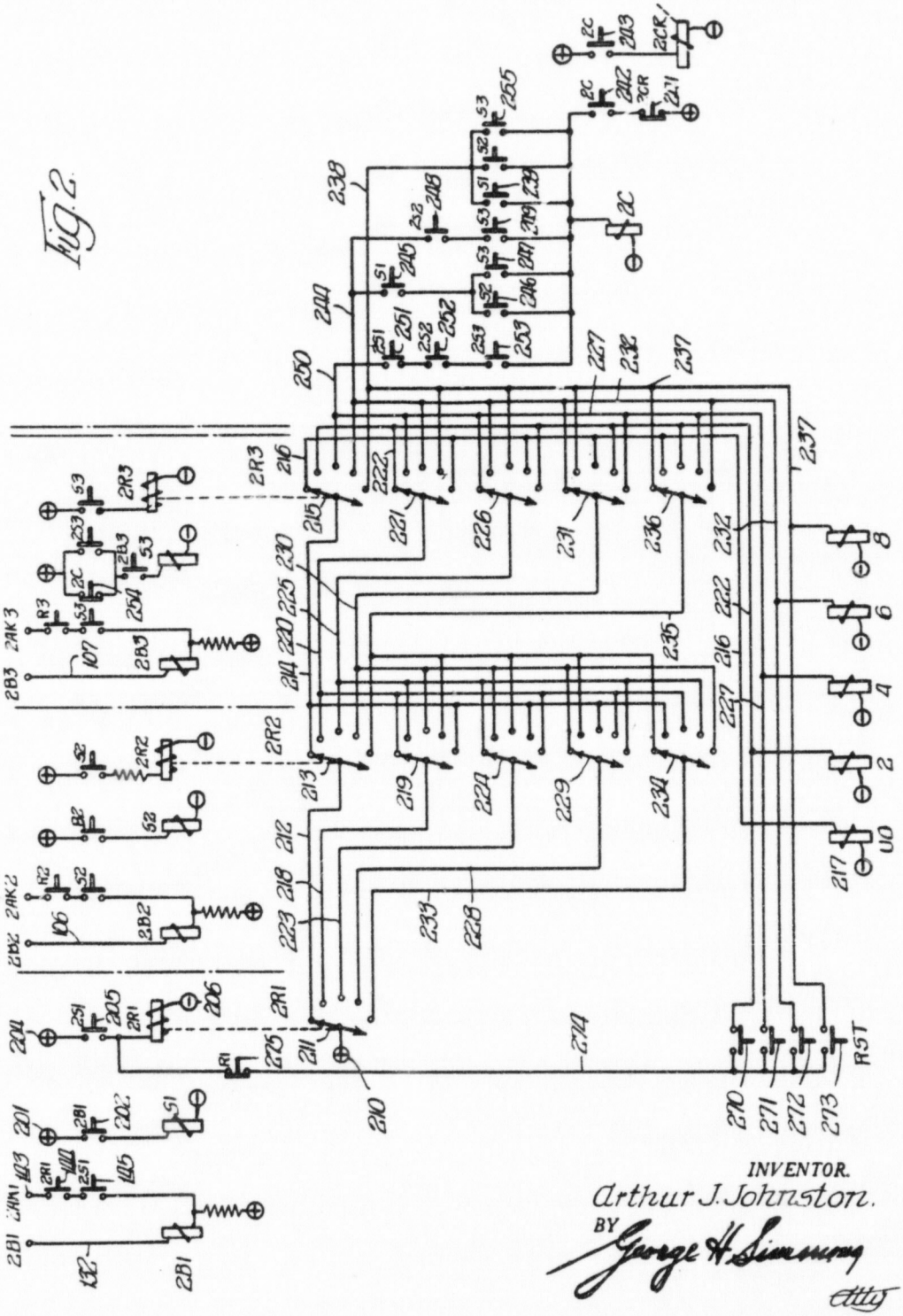
IVPH

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 2

Fig. 2.



INVENTOR.
Arthur J. Johnston.
BY George H. Simmons
Atty

A572

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 3

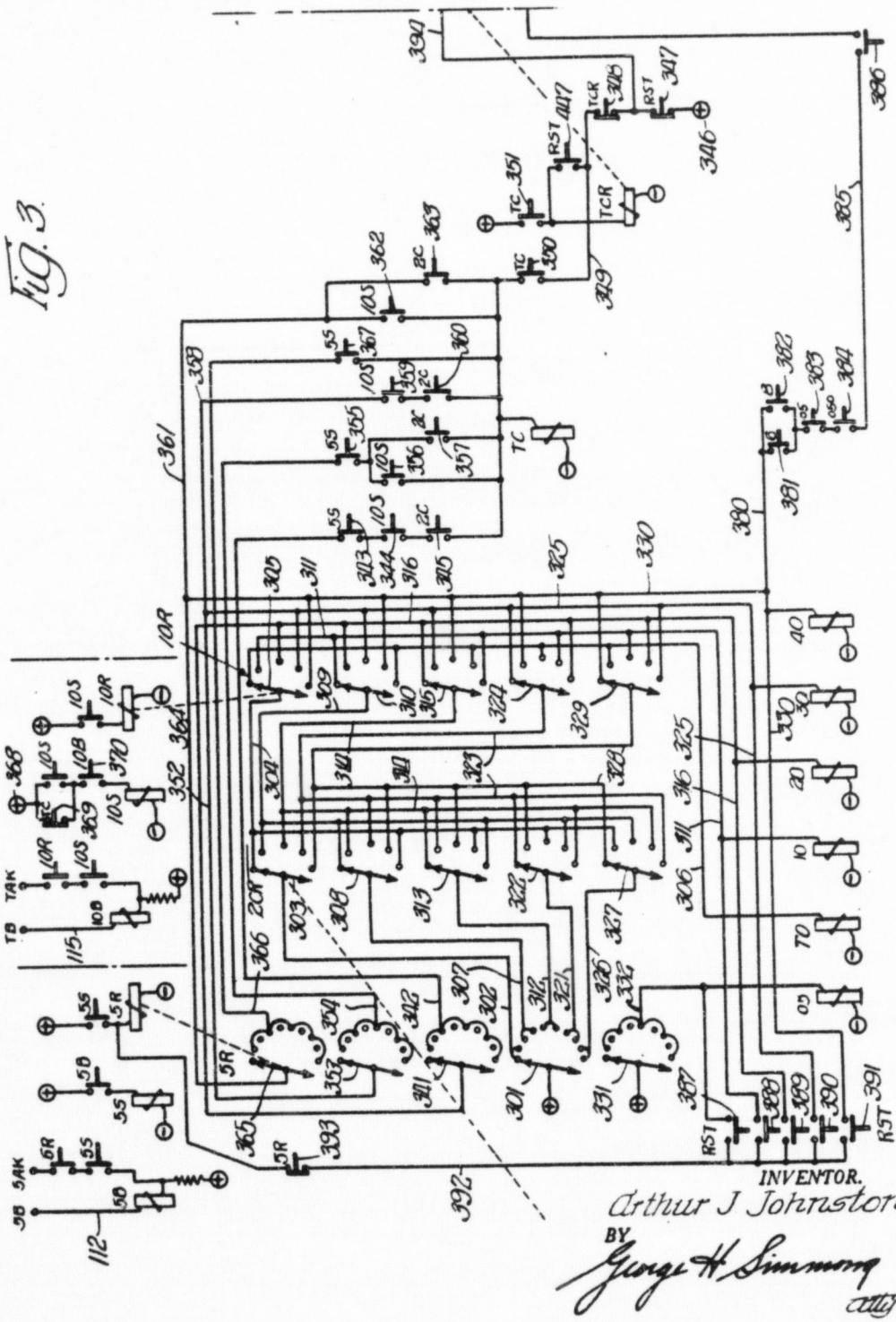


Fig. 3.

INVENTOR.
Arthur J Johnston,
BY
George H Simmons
Atty

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 4

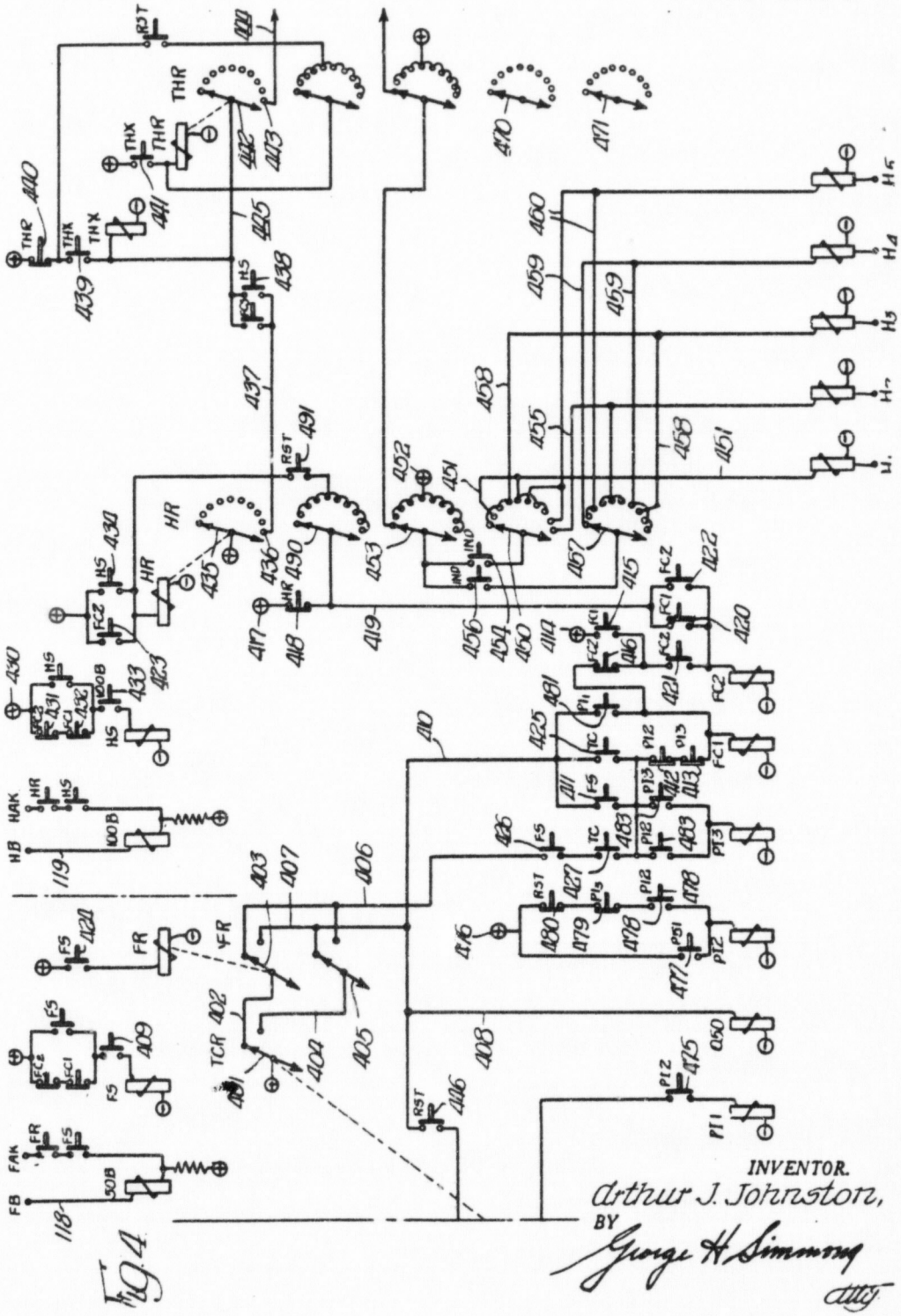


Fig 4

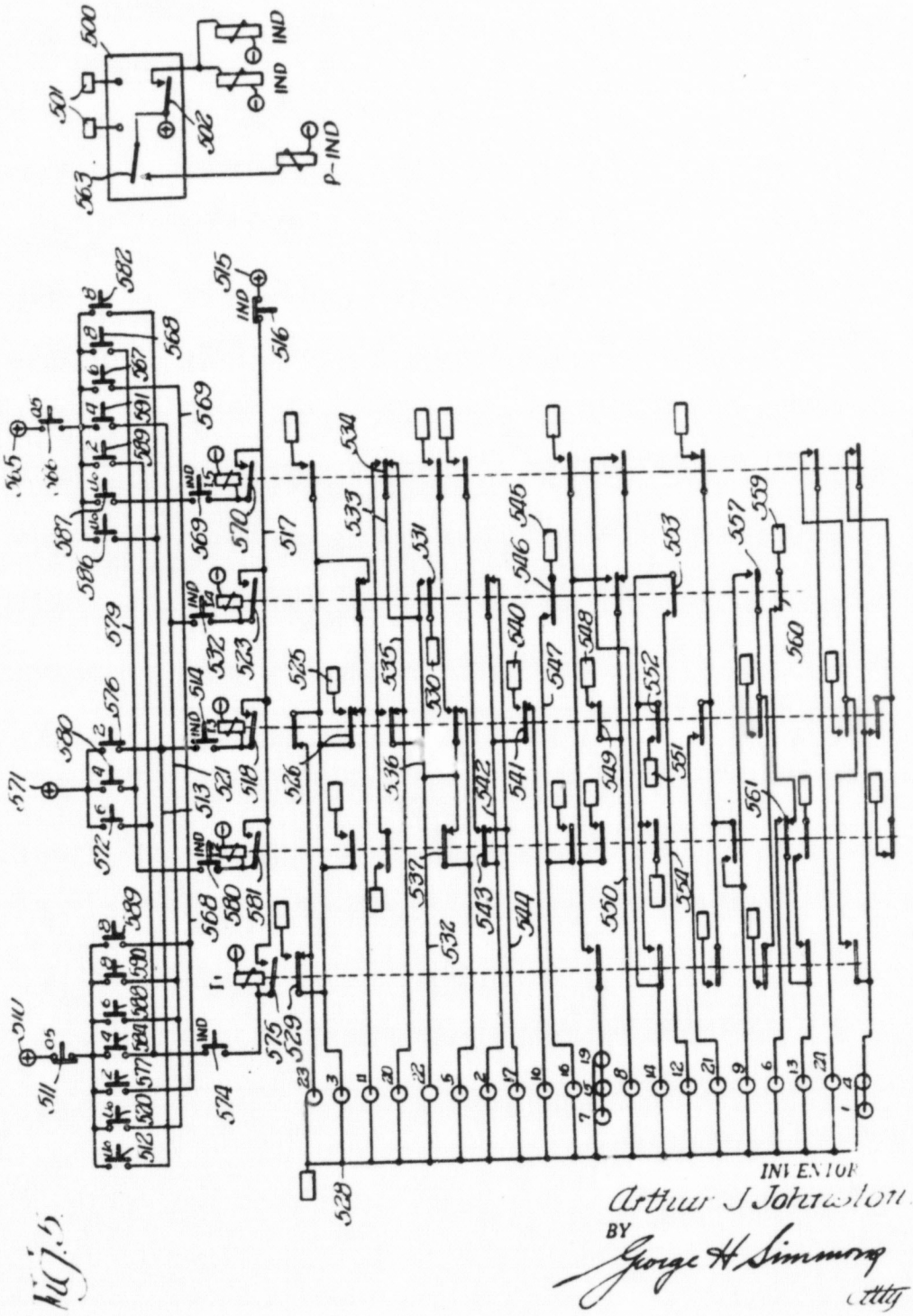
INVENTOR.
Arthur J. Johnston,
BY
George H. Simmons
atty

A574

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 5



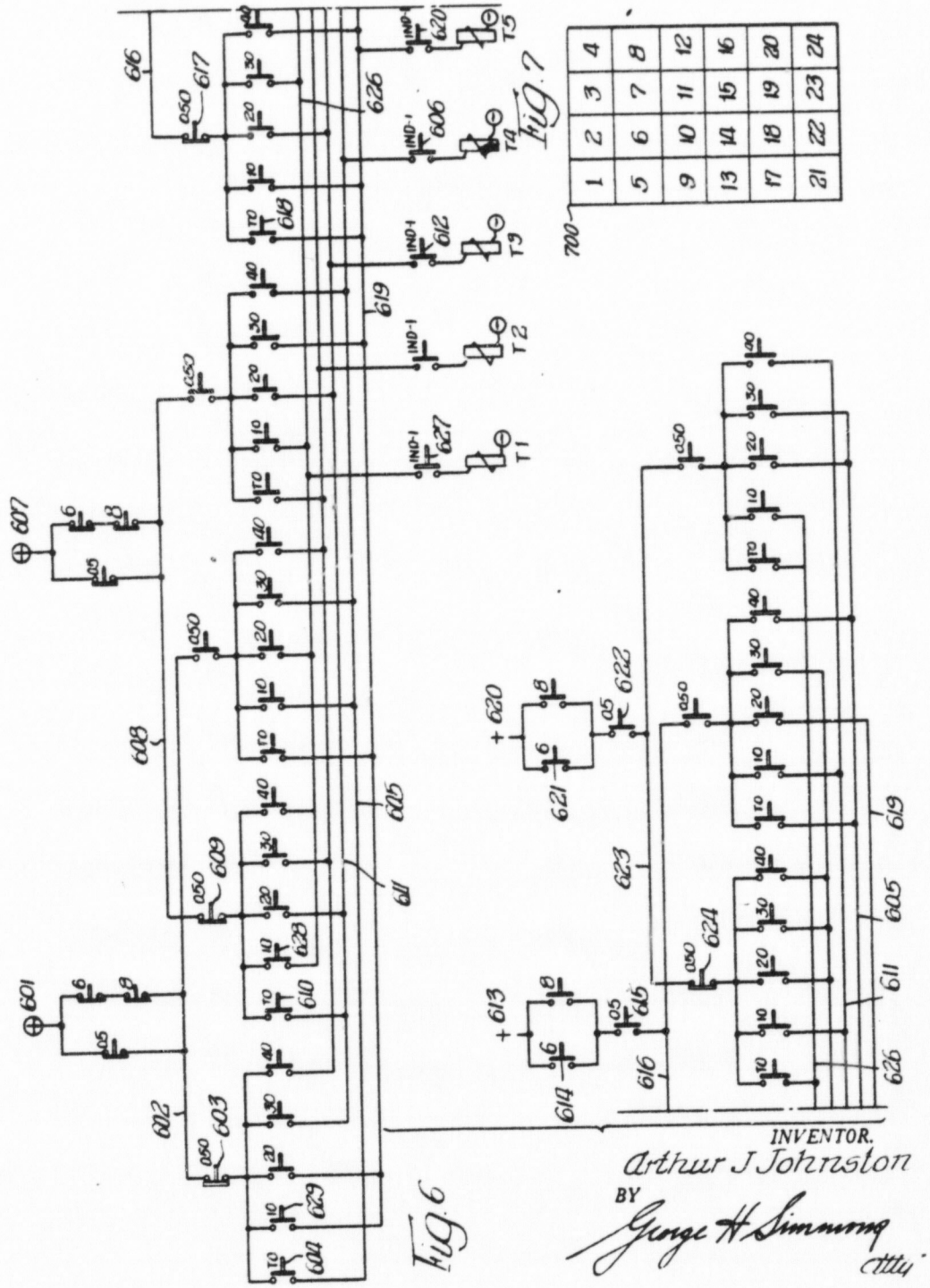
INVENTOR
Arthur J Johnston
BY
George H. Simmons
Atty

a hundreds register; a tens carry relay operable in the machine; a wiper on said five units switch;

Aug. 7, 1951 A. J. JOHNSTON 2,563,041

TOTALIZATOR SYSTEM

Filed March 22, 1948 6 Sheets-Sheet 6



1	2	3	4			
5	6	7	8			
9	10	11	12			
13	14	15	16			
17	18	19	20			
21	22	23	24			

700

FIG. 7

FIG. 6

INVENTOR.
Arthur J Johnston
BY
George H Simmons
Atty.

Patented Aug. 7, 1951 2,563,041

UNITED STATES PATENT OFFICE

2,563,041

TOTALIZATOR SYSTEM

Arthur J. Johnston, Baltimore, Md., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application March 22, 1948, Serial No. 16,310

12 Claims. (Cl. 235—92)

1

This invention relates to totalisator system adding machines and has for its principal object the provision of a new and improved device of this kind.

It is a main object of the invention to provide an adding machine capable of registering a plurality of values simultaneously, accurately and rapidly, and to transfer values from one digit to the next higher as the sums accumulated in the machine necessitate such transfers.

Another object of the invention is to provide an adding machine register that is controllable over a plurality of channels to receive and register incoming values, arranged to momentarily render one of said channels inoperative during the transfer of values out of the register.

Another object of the invention is to provide an improved fundamental circuit for controlling a totalisator system over which circuit values are simultaneously registered in two, interconnected adding machines with greater speed and accuracy, which machines, at the completion of said registrations, jointly control a ticket machine which prints and issues a ticket corresponding to the value registered.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

Fig. 1 is a diagrammatic layout of the system employing the invention and showing particularly the fundamental control circuit;

Fig. 2 is a schematic diagram showing particularly the units register and control therefor;

Fig. 3 is a schematic diagram showing particularly the tens register and control therefor;

Fig. 4 is a schematic diagram showing particularly the fifties, the hundreds, and the thousands registers and controls therefor;

Fig. 5 is a schematic diagram of the units indicator and circuits controlling the same;

Fig. 6 is a schematic diagram of the tens indicator control circuits; and

Fig. 7 is a diagrammatic view of an indicator panel showing the numbers of the lamps therein.

The totalisators, such as are employed to register wagers at a race track, for example, must be capable of operating at very high speed; however, the speed must not be achieved at the expense of accuracy. In accordance with the teachings of the present invention, in order to achieve higher speeds without sacrificing accuracy, the adding machines employed are each capable of

2

receiving and registering a plurality of wagers or other sales transactions simultaneously. Thus, in one example, the adding machines employed at a race track are equipped to handle three independent channels over which two-dollar ticket sales are controlled, and in addition are equipped with one five-dollar channel, one ten-dollar channel, one fifty-dollar channel, and one one-hundred-dollar channel, so that each of the adding machines is capable of accepting seven transactions simultaneously.

As will be readily apparent to one skilled in the art, this feeding into the adding machine of numerous simultaneous transactions of various denominations necessitates an accurate transfer system whereby values of a lower denomination, units for example, are transferred to the tens digit section of the machine when the values accumulated in the unit section equal ten. This transfer must be made at high speed and frequently will have to be made simultaneously with the registering of transactions originating in the tens digit section of the machine.

One of the objects of the present invention is to improve upon register and transfer circuits so that the speed can be increased without sacrificing accuracy.

As will be seen in Fig. 1, which is a typical installation of the type to which the instant invention refers, a total adding machine 100 is connected to the searching end of a collecting device 101, as is diagrammatically illustrated by connections leading to the wipers 102. While a stepping switch type of collector is illustrated, it is shown by way of example only, as other types of collector devices, such far example the all-relay collector shown in Patent #2,179,698 issued to Levy and Johnston November 14, 1939, may be substituted if desired. Whatever the collector device may be, it searches over a plurality of ticket-issuing machines illustrated at 103, wherein the first machine in the group is shown.

Within the ticket machine are a plurality of keys 104, one for each runner upon which the machine is designed to issue tickets, which keys are depressed to select the particular runner. Depressing the key extends the circuit to an individual runner adding machine 105 preparatory to closing a basic circuit over which the sale of the ticket is registered in both the total and individual runner adding machines, and after which the ticket machine is operated to print and issue the ticket.

The particular type of ticket machine used is not of the essence of the present invention and

there are suitable machines available on the open market. For example, ticket printing and issuing machines of the type shown in Patents #1,886,626 and #1,886,627, issued to H. D. Black on November 8, 1932, have been used successfully.

The total adding machine is also equipped with two other channels 106 and 107 which lead to separate collectors 108 and 109, respectively, which in turn lead to similar ticket machines 110 and 111, and through keys in these machines to the same group of individual adding machines as contains machine 105. The total adding machine 100 also contains a five-units channel 112 which has an individual collector 113 that searches over a group of five-units ticket machines 114, through which connections are extended to the adding machines 105. Similarly, there is a ten-units channel 115 with its collector 116 leading to a group of ten-units ticket machines 117 which in turn extend circuits to the adding machines 105. The adding machine 100 also has a fifty-units channel 118 and a hundred-units channel 119 which, in the example shown, are connected to a dual-purpose collector 120 wherein searching means 121 and 122 are individual to the two channels respectively, the searching means 121 leading to a group of fifty-units ticket machines 123, and the searching means 122 leading to a group of one-hundred-units ticket machines 124. Both of the ticket machines 123 and 124 extend circuits to the adding machine of which machine 105 is an example.

The units referred to above, in the case of a total adding machine for race track work, will be dollars, channels 102, 108, and 109 being two-dollar channels and lead to the three groups of two-dollar ticket machines, each group of which contains a plurality of individual ticket machines, and there may be as many ticket machines in each group as desired, limited only by the capacity of the collectors. Preferably, however, the number of ticket machines in a particular group should be maintained as small as possible, thereby to minimize the time required for the collectors to search out an individual machine and consequently reduce the time that must elapse between successive operations of that individual machine. The total number of ticket machines will, of course, depend upon the requirements of a particular installation and the number of machines in a group will vary accordingly.

The fundamental circuit over which the total and individual runner adding machines are operated to register a transaction and when that registration is completed the ticket machine is operated to print and issue the ticket, will be recognized as similar to the series circuit shown in Patent #2,182,875, issued to Levy December 12, 1939.

When the collector extends a connection to ticket machine 103, in which the key 104 is depressed to indicate a selection of runner number one, a circuit may be traced from positive at 130, through a resistor 131, through the winding of the relay 2BI, conductor 132, through the collector device 102 and contact engaged thereby, conductor 133, through the winding of relay 134 in the ticket machine, through the normally closed contacts 135 controlled by the relay 134, through key 104 and its make contact, conductor 136 through the winding of the relay IIBI to negative. Relays 2BI and IIBI, being high sensitivity relays, operate immediately, closing circuits hereinafter to be explained, to register a two-dollar transaction in both adding machines. Relay 134 being a low sensitivity relay, will not operate at this time.

In the individual adding machine 105, operation of the relay IIBI closes a circuit to a rotary register switch which operates to close contacts 140. Operation of relay IIBI also closes contacts 141, whereupon a circuit is extended from positive at 142 over acknowledging conductor 143 that leads to the total adding machine 100.

In the total adding machine 100, operation of relay 2BI closes circuits to a rotary stepping switch which operates to close contacts 144 to extend this circuit to contacts 145 which are closed when the 2BI relay operates. The acknowledging circuit is thus extended to the juncture of the resistor 131 and relay 2BI to apply positive to both terminals of the resistor, thereby to remove the resistor from the circuit and consequently increase the current flow therein. This added current flow operates relay 134 in the ticket machine, whereupon that machine functions to print and issue a ticket and also to open the fundamental circuit, by opening contacts 135 so as to release the collector 101 to permit it to seek out another ticket machine in the group in which a key is depressed to indicate a pending transaction.

The substitution of a resistor, such as 131, in series with the relays in the fundamental circuit for the resistor placed in parallel with one of the relays as in the above mentioned Levy patent, permits achieving a greater difference between the low current value and the high current value, and consequently the high sensitivity relays can be adjusted to operate faster without danger of a misoperation of the low sensitivity relay, and as a result both the speed and accuracy of the circuit has been improved.

Within the adding machines, the closing of the fundamental circuit as above initiates operation leading to the registration of the value of the transaction. In Figs. 2, 3, and 4, there are shown the circuits of the units, tens and hundreds registers of a total adding machine. The circuits of the individual adding machines are identical, except that the fundamental circuit relays IIBI, for example, are connected to negative instead of through resistors to positive, as shown in these figures.

Registering a two-units ticket sale

As will be seen in Fig. 2, the operation of relay 2BI, as above explained, closes a circuit from positive at 201, through normally open contacts 202 that are closed when the relay operates, through the winding of a sleeve relay SI to negative at 203. The slave relay operates over this circuit. In order to keep the speed of the high senstivity relays in the fundamental circuit, of which 2BI is an example, as high as possible, the number of springs carried by the relay is maintained at a minimum; and slave relays, such as SI, are employed to carry such additional springs as may be necessary. Each time the fundamental relay 2BI operates, its slave SI is also operated, and so far as the electrical connections are concerned it is the same as if only one relay was operated.

Operation of the relay SI closes a circuit from positive at 204 through springs 205 on SI, through the magnet 2RI of the register switch 2RI to negative at 206. The register switch 2RI preferably consists of a rotary switch having one or more wipers which step over a bank of contacts sequentially, the stepping movement being accom-

plished as the magnet deenergizes rather than as the magnet energizes. Stepping switches of this type are readily available, the one preferably used having banks of contacts containing twenty contacts in each row and as many as five rows of contacts may be conveniently used without overloading the switch.

Operation of relay S1 also closes contacts 145 thereby to prepare a point in the acknowledging circuit over conductor 143. As soon as magnet 2R1 operates, contacts 144 are closed, thereby to extend the acknowledging circuit which will be completed immediately if the registration has been completed in the individual adding machine.

As will be seen in Fig. 2, the conductor 106 in the second channel in the group leads to a similar fundamental relay 2B2 which in turn controls an S2 relay, thereby to close a circuit to the second register magnet 2R2 to register a transaction received over the second channel. The third channel conductor 107 leads to a fundamental relay 2B3 which operates to control its slave S3 thereby to control the magnet 2R3 of a third stepping switch.

In the units register, the stepping switch 2R1 employs but a single wiper that engages a row of contacts, five of which are employed, and multiple connections are used so that the wiper sweeps over this group of five contacts four times in traveling over the row of contacts; that is to say, contact 1 in the row is connected in multiple with contacts 6, 11, and 16; contact 2 with 7, 12, and 17, etc. Register switch 2R2 employs five wipers, each of which engages a row of twenty contacts, five of which are employed, and the remaining contacts use multiple connections to these in the same manner as in the switch 2R1. Switch 2R3 likewise employs five wipers with five contacts employed in each row, and multiple connections are used as in the other switches.

Switches 2R1, 2R2, and 2R3 jointly control units register relays U0, 2, 4, 6, and 8, by the operation of which relays values of zero units, two units, four units, six units, or eight units, respectively, are registered in the register. With the switches in the position shown in Fig. 2, a circuit may be traced from positive at 210 through wiper 211 of the switch 2R1, conductor 212 which leads to wiper 213 of the switch 2R2, which wiper is engaging the contact to which conductor 214 is connected, which conductor 214 leads to the wiper 215 in the switch 2R3 which, at the moment, is standing on the contact to which conductor 216 is connected, this conductor 216 leading through the winding of relay U0 to negative at 217. U0 operates to indicate zero units in the register at the moment.

In the event that a transaction is received over any one of the channels leading into the adding machine, the circuit to relay U0 will be broken and the circuit to relay 2 will be closed in lieu thereof. Assume for the moment that the first transaction is received over the first channel, in which case relay 2B1 will operate as above, and magnet 2R1 will be operated and switch 2R1 will move wiper 211 from its first to its second contact when the magnet de-energizes. A circuit may now be traced from positive at 210 through wiper 211, conductor 218, which is connected to the second contact which is engaged by wiper 211 and leads to wiper 219 in the switch 2R2 which is standing on its first bank contact to which conductor 220 is connected, this conductor leading to wiper 221 in the switch 2R3 also standing on its first bank contact to which conductor 222 is connected, over conductor 222 through the winding of relay 2 to negative. Relay 2 operates over this circuit to indicate two units in the register.

If a second transaction is received over channel B1 before any transactions are received over the other channels, switch 2R1 will again be operated to move wiper 211 to its third bank contact to which conductor 223 is connected, this conductor leading to wiper 224 in switch 2R2 now engaging its first bank contact to which conductor 225 is connected, this conductor leading to wiper 226 in the switch 2R3. Conductor 227 is connected to the first bank contact engaged by the wiper 226 and leads through the winding of relay 4 to negative, so that this second transaction will operate relay 4 to register four units in the machine.

The fourth contact in the bank engaged by wiper 211 is connected through conductor 228 to wiper 229 in the switch R2, and the first contact in the bank engaged by this wiper is connected over 230 to the wiper 231 in the switch 2R3. Conductor 232 leads from the first bank contact engaged by wiper 231 through the winding of relay 6 so that an additional step by switch 2R1, before any of the other switches are stepped, will operate relay 6 to indicate the accumulation of six units in the register.

The fifth contact engaged by wiper 211 is connected through conductor 233 to the wiper 234 in the switch 2R2, and the first contact in the bank engaged by this wiper is connected through conductor 235 to the wiper 236 in the switch 2R3. Conductor 237 is connected to the first bank contact engaged by wiper 236 and leads to relay 8 so that an additional step by wiper 211 will energize relay 8 to indicate the accumulation of eight units.

Simultaneous transactions

It will frequently happen that the individual collectors in the three channels B1, B2, and B3, leading into the units register, will connect with ticket machines in which transactions are awaiting simultaneously, so that switches 2R1, 2R2, and 2R3 will all be operated. Assuming that the switches are in the position shown in Fig. 2 when this occurs, after each has taken one step, a circuit may be traced from positive at 210 through wiper 211 and its second contact, conductor 218, wiper 219 and its second contact which is connected to conductor 225, wiper 226 and its second contact which is connected to conductor 232, thence over that conductor through the relay 6 to negative, and the relay 6 will be operated to indicate the accumulation of six units in the register. If, for example, channels B1 and B2 are closed simultaneously, but B3 is not, switches 2R1 and 2R2 will take one step, but switch 2R3 will remain in the position shown in Fig. 2. The previously traced circuit to wiper 226 will, under these circumstances, be extended through the first bank contact and conductor 227 through the winding of relay 4 to indicate four units in the register. Thus it will be seen that regardless of the position of the wipers of the various switches an operation of any one switch will add two units to the register, an operation of any two switches will add four units, and an operation of all three switches simultaneously will add six units to the register.

As soon as the sum accumulated in the units register equals 10, transfer to the tens register must be made. This is accomplished as follows;

Transfer to tens register

Assume for the moment that relay 8 is operated to indicate eight units in the register, and that an additional transaction is received over channel 2B1. It will be noted that conductor 237 leading to the relay 8 is extended over conductor 238 which latter conductor splits through parallel paths, including normally open contacts on relays S1, S2, and S3. Since we are assuming that the additional transaction is coming in over circuit 2B1, contacts 239 controlled by relay S1 will be closed, extending the circuit of winding relay 2C to negative, operating the relay 2C. This relay locks itself in operated position from positive at 240 through normally closed contacts 241 that are operated by the units carry rotary switch 2CR, normally open contacts 242 on the relay 2C, through the winding of the relay to negative. Upon operating, relay 2C also closes contact 243 which closes the obvious circuit through the winding of magnet 2CR, Fig. 3, to effect the transfer in the manner hereinafter to appear. In the event that, under the conditions assumed, the transaction is received over the 2B2 or the 2B3 instead of the 2B1 channel, then the circuit over conductor 238 will be extended to relay 2C over the branch containing the contacts S2 or S3, instead of contacts 239; otherwise the operation will be as above. Thus it will be seen that when eight units are contained in the units register, receipt of an additional transaction over any one of the three channels will result in the operation of the carry relay 2C to effect a transfer to the tens register.

In the event that six units are registered in the units register and two transactions are received simultaneously, transfer will likewise be necessary since the sum will equal ten. This is accomplished by a circuit branching off conductor 232 through conductor 244, which circuit branches over parallel paths, the one extending through normally open contacts 245 controlled by relay S1, and then branches again through either one of contacts 246 controlled by relay S2 or contacts 247 controlled by relay S3. Thus the receipt of simultaneous transactions over channel B1, and either channel B2 or channel B3, will complete a circuit through the carry relay 2C to effect a transfer to the tens register. A second branch leading from conductor 244 extends through normally open contacts 248 controlled by relay S2 and contacts 249 controlled by relay S3, so that the receipt of simultaneous transactions over channels 2B2 and 2B3 will likewise complete a circuit for relay 2C to effect a transfer to the tens register.

In the event that four units are stored in the units register and three transactions are received simultaneously, transfer to the tens register will also occur. Conductor 227 leading to the relay 4 is extended over conductor 250, through contacts 251 controlled by the relay S1, contacts 252 controlled by the relay S2, and contacts 253 controlled by the relay S3, all of which contacts will be closed when the relays are energized simultaneously, thereby completing a circuit through the winding of relay 2C to negative, to operate this relay to effect a transfer.

Transfers on successive steps of the collector

In certain instances values may be received in the units register, in such sequence as to require transfers to the tens register on successive steps of the collectors. Thus, for example, if there are eight units registered in the units register and transactions are received simultaneously over the three channels, the sum of eight and six will equal fourteen, and transfer of ten will be made with four units remaining in the units register, this transfer being effected as above. If on the next step of the collectors, transactions are awaiting in each of the channels, six more units will be picked up and a second transfer will be necessary. Transfers on successive steps of the collector can be accomplished successfully if the transfer relay 2C operates as fast as the fundamental circuit relays 2B1, 2B2, and 2B3. While it is possible to maintain relay 2C in such an adjustment, its reliability under these conditions is not as great as desired and consequently arrangements are provided to prevent the necessity of transfer on two successive operations of the collectors.

As will be seen in Fig. 2, the circuit to relay S3 extends through normally closed contacts 254 which are opened when relay 2C is operated. Thus, during the first of the two successive transfers, all three channels can be operated simultaneously and relay 2C will be operated to effect the transfer. As soon as the acknowledging circuits are completed, the fundamental circuits are opened and the collectors allowed to take a second step. Because the relays 2B1, 2B2, and 2B3 operate faster than the relay 2C, these relays will be re-operated before relay 2C has restored to normal. On this second operation, relays 2B1 and 2B2 will complete circuits to their associate relays S1 and S2 as before, and four units will be added to the four units now assumed to be accumulated in the units register. Operation of relay 2B3, however, will not complete the circuit to relay S3 until relay 2C has restored after the previous transfer to the tens register has been completed. As soon as relay 2C does restore, relay S3 will operate and a circuit for relay 2C will be completed through contacts 255, since there are eight units already accumulated in the units register. This momentary delaying of the third of the three channels, in the event of successive transfers, insures that the carry relay 2C will have ample time to complete its cycle of operation to effect the transfer accurately.

The tens register

As will be seen in Fig. 3, there are three control channels leading into the tens register, one of which includes a switch 2CR, that is controlled by the units carry relay 2C. The second control channel is the five units value channel FB, which contains the basic circuit relay 5B, its associate slave 5S, and the rotary switch 5R, the operation of which are identical with that previously described for the two units channels. Switch 5R is equipped with five wipers each of which engage banks of twenty contacts, ten of which are employed, and the second ten multiple to the first ten, so that each individual circuit is completed twice as the switch steps over its bank contacts.

Switch 2CR employs but five contacts as in the units register, these contacts being multiplied so that each circuit is completed four times as the wipers make one sweep over their respective banks.

The third channel leading into the tens register is the tens units channel 10B which contains a fundamental circuit relay 10B, its associated slave 10S, and the rotary switch 10R. Switch 10R likewise employs five banks, and five contacts in each bank are utilized, the remainder being multiplied thereto so that each circuit is completed four times as the wipers sweep over

their respective banks. The circuits of the switches in the tens register are as follows:

Wiper 301 engages contacts in its bank, the first two of which are connected through conductor 302 to the wiper 303 of the switch 2CR, and when there are zero units in the tens register the circuit is extended over conductor 304 through wiper 305 of the switch 10R and the first bank contact engaged thereby and to which conductor 306 is connected, conductor 306 leading through the winding of relay T0 to negative, to operate that relay to indicate zero units in the tens register.

The third and fourth contacts in the bank engaged by wiper 301 are connected through conductor 307 to the second wiper 308 in switch 2CR, and the first contact engaged by this wiper is connected through conductor 309 to the wiper 310 in the switch 10R. The first bank contact engaged by wiper 310 is connected through conductor 311 to the relay 10 so as to operate that relay to indicate ten units in the register.

The fifth and sixth contacts engaged by wiper 301 are connected over conductor 312 to the third wiper 313 in switch 2CR, the first bank contact engaged by this wiper being connected through conductor 314 to the third wiper 315 in switch 10R, and the first contact engaged by this wiper being connected over conductor 316 to the relay 20 to permit operating that relay to indicate 20 units in the tens register.

The seventh and eighth contacts engaged by wiper 301 are connected through conductor 321 to the fourth wiper 322 in switch 2CR, the first bank contact engaged by this wiper being connected through conductor 323 to the fourth wiper 324 in the switch 10R. The first contact engaged by wiper 324 is connected through conductor 325 to relay 30 to enable operation of that relay to indicate thirty units in the register.

The ninth and tenth contacts engaged by wiper 301 are connected through conductor 326 to the wiper 327 in the switch 2CR, and the first contact in the bank engaged by this wiper is connected through conductor 328 to wiper 329 in the switch 10R. The first contact engaged by wiper 329 is connected through conductor 330 to the relay 40 to permit operating that relay to indicate forty units in the register.

Since the switch 5R is operated one step for each five units value received in the register over the channel 5B, each second value so received will de-energize the register relay then operated and operate the next higher register relay to indicate ten units accumulated in the register.

The wiper 331 on the switch 5R sweeps over a bank of contacts, even numbered ones of which are strapped together and connected through conductor 332 to the relay O5. Thus, when the switch 5R takes one step, for example, from the number one contact on which the wipers are resting, in Fig. 3, to the number two contact, a circuit will be completed from positive through wiper 331, conductor 332, through relay O5 to negative, to operate that relay to indicate five units in the tens register. If it be assumed that switch 5R is standing on the first contact as shown in Fig. 1, this single operation will not break the circuit through wiper 301 to the relay T0 and that relay will remain operated and the total value then accumulated in the register will be five units.

Switch 2CR will be operated to take one step each time the carry relay 2C is operated to effect a transfer from the units register. The wipers 303, 308, 313, 322 and 327 take one step thereby to break the circuit of the register relay then operated and to close a circuit to the next higher register relay.

Switch 10R is operated each time a ten units transaction is received over the channel 10B and its wipers move one step also to de-energize the register relay then energized and to operate the register relay to indicate the next higher tens value.

Simultaneous transactions in the tens register

If the wipers of the switches of the tens register are in the position shown in Fig. 3, and simultaneous transactions are received over the channel 5B, the carry circuit from the units register, and the channel 10B, twenty-five units will be added to the value then accumulated in the register through the operation of the switches 5R, 2CR, and 10R, each through one step. Relay T0 will be restored to normal and relay 20 will be operated along with relay O5 to indicate twenty-five units in the register.

If the next step of the various collectors also closes all three of the control channels into the register, the three switches will again step, the switch 5R moving to de-energize the relay O5 by moving wiper 301 from an even to an odd contact, thereby transferring the circuits through that wiper to a different wiper in switch 2CR. Switches 2CR and 10R will step one step as before, and twenty-five units will thus be added to the twenty-five already assumed to be in the register, thereby making the total in the tens register equal fifty, which necessitates a transfer to the fifty units section of the hundreds register.

The fifty units section of the hundreds register, for convenience herein sometimes referred to as the "Fifty Register," consists of two register switches. One of these switches TCR, Fig. 4, is operated to take one step on each transfer from the tens register, and the other switch FR is operated to take one step each time a transaction is received over channel FB.

Transfer from the tens to the fifty register

With twenty-five units accumulated in the tens register, switch 5R will be standing on an even numbered contact, and a circuit for relay 20 will be completed over conductor 316, this conductor being extended through conductor 340 through the wiper 341 of switch 5R, then engaging an even numbered contact in its bank to which conductor 342 is connected, this conductor leading through contacts 343 closed by an operation of relay 5S, contacts 344 closed by an operation of relay 10S and contacts 345 closed by an operation of relay 2C, thereby extending a circuit through the winding of relay TC to negative. Relay TC upon operating locks itself from positive at 346 through normally closed contacts 347 on a re-set relay RST, normally closed contacts 348 on the magnet of the tens carry rotary TCR, conductor 349, through normally open contacts 350 closed by the operation of relay TC through the winding of relay TC to negative. Relay TC also closes contacts 351 thereby to close the obvious circuit to positive through the tens carry rotary switch magnet TCR to operate that magnet to effect a carry to the fifty register.

As soon as relays 5B, 10B, and 2C restore, their respective stepping switches each take a step and the wipers of the switches are positioned so as to extend the circuit to relay T0 thereby to complete the registration of the twenty-five units, all of which have been transferred from the tens to the fifty register.

In the event that thirty or thirty-five units are registered in the tens register, relays 30 and O5 will be operated and receipt of two simultaneous transactions over any two of the three channels leading into the tens register will necessitate a carry to the fifty register. Assume first that one of the transactions comes in over the 5B channel. A circuit may then be traced from conductor 325 through conductor 352, wiper 353 of the switch 5R, which will then be engaging an even numbered contact to complete the circuit for relay O5, conductor 354 which is connected to the even numbered contacts engaged by wiper 353, normally open contacts 355 which will be closed when relay 5S operates to initiate the registration of the transaction, and thence over either one of parallel paths, the one through contacts 356 which will be closed by relay 10S if the second of the two simultaneous transactions comes in over the 10B channel, thence through the winding of relay TC to negative, or through contacts 357 which will be closed by relay 2C if the second transaction comes in over the units carry channel, thereby to operate relay TC to effect a transfer.

If the two simultaneous transactions come in over the TB and units carry channels, a circuit may be traced from conductor 325, conductor 358, through normally open contacts 359 which will be closed by the operation of relay 10S, contacts 360 closed by the operation of relay 2C, and thence through the winding of relay TC to negative. Thus it will be seen that with thirty-five units registered in the tens register, any two simultaneous transactions received by this register will effect transfer; and with thirty units accumulated in the tens register, transactions received simultaneously over the units carry and tens units channels will likewise effect a transfer.

In the event that there are forty units in the tens register, an operation of either the units carry channel or the 10B channel will necessitate a transfer and a circuit may be traced from conductor 330 through conductor 361 and thence over parallel paths, the one through contacts 362 closed by the operation of relay 10S to complete the circuit for relay TC and the other through contacts 363 closed by relay 2C also to complete the circuit through relay TC.

In the event that in addition to the forty units in the tens register, there is also an odd five units value in the register, switch 5R will have its wipers positioned on even numbered contacts, and the circuit from conductor 330 will have a third parallel path extending through conductor 364 through wiper 365 of the switch 5R, conductor 366 connected to the even contacts engaged by this wiper, normally open contacts 367 closed by the operation of relay 5S through the winding of relay TC, and relay TC will be operated to effect transfer to the fifty register.

In order to insure that transfers from the tens register to the fifty register will be accurately made, the circuit of relay TS is extended from positive at 368 through normally closed contacts 369 on the relay 10C, through normally open contacts 370 on relay 10B through the winding of relay 10S to negative. So long as there is no carry in progress, TC will be deenergized and contacts 369 will be maintained closed so that when relay 10B operates, the circuit for relay 10S will be closed. If, however, relay TC is operated to effect a transfer, an operation of relay 10B will not be able to complete the circuit of relay 10S and the transaction coming in over the 10B channel will be delayed until the carry is completed.

Hundreds register

The hundreds register shown in Fig. 4 consists of a stepping switch TCR operated to effect transfers of fifty units from the tens register, a stepping switch FR operated over the fifty units channel FB to register fifty units transactions, which switches comprise the "Fifty Register," and a stepping switch HR operated over the hundred units channel HB to register one hundred units values. In the switch TCR one wiper 401 is employed and the odd numbered contacts in the bank engaged by this wiper are connected by conductor 402 to the first of two wipers 403 in the switch FR. The even numbered contacts of the bank in switch TCR are connected by conductor 404 to the second of two wipers 405 in the switch FR.

Switch FR likewise utilizes but two contacts, the odd numbered contacts in the bank engaged by wiper 403 and the even numbered contacts in the bank engaged by wiper 405 being connected together and to conductor 406. The even contacts engaged by wiper 403 and the odd contacts engaged by wipers 405 are likewise connected together and to the conductor 407. Assume for the moment that the wipers of the switches TCR and FR are in the position shown in Fig. 4, and that magnet TCR is operated to effect a transfer of fifty units from the tens register to the "Fifty Register." Upon the restoration of magnet TCR, a circuit may be traced from positive through wiper 401 and an even numbered contact in its bank, conductor 404, wiper 405, conductor 406, through the winding of the odd fifty relay O50 to negative, operating relay 050 to indicate that fifty units have been placed in the "Fifty Register."

A second fifty units value may come into the hundreds register, either over the fifty units channel FB or from the tens carry. Assume that the second fifty units value comes over the channel FB. Relay 50B will be operated and with it relay FS, responsive to the closing of contacts 409 on the 50B relay.

The circuit just traced to conductor 407 will now be extended over conductor 410, through contacts 411 closed by the operation of relay FS, through normally closed contacts 412 on the preliminary indication relay PI2, normally closed contacts 413 on the preliminary indication relay PI3 through the winding of the fifty carry relay FC1. FC1 operates, closing a locking circuit for itself that extends from positive at 414, contacts 415 closed by FC1, normally closed contacts 416 on relay FC2, through the winding of FC1 to negative. A circuit may now be traced from positive at 417, through normally closed contacts 418 on the hundreds rotary switch HR, conductor 419, contacts 420 closed by FC1, through the winding of fifty carry relay FC2 to negative. Relay FC2 operates and closes a momentary locking circuit for itself from positive at 414 through contacts 415, contacts 421, through the winding of relay FC2, this locking circuit being maintained but momentarily since operation of FC2 opens contacts 416 thereby breaking the locking circuit of relay FC1 which restores.

Operation of FC2 closes a second locking circuit for itself through contacts 422 to positive on conductor 419. Operation of relay FC2 closes a circuit for the hundreds rotary magnet HR through springs 423, energizing that magnet preparatory to stepping the hundreds rotary HR one

step. Operation of magnet HR opens normally closed contacts 418, thereby breaking the locking circuit for relay FC2, to permit that relay to restore, whereupon the magnet HR is de-energized and the wipers of switch HR advanced one step to register one hundred units.

Operation of relay FS, as above, also closes the circuit for the magnet FR of the fifty rotary by operating contacts 424, energizing that magnet preparatory to stepping the wipers one step. As soon as the acknowledging circuit over channel FB has been completed, as explained in connection with Fig. 1, relay FS restores and the switch is stepped one step, whereupon wipers 403 and 405 will advance to their respective second contacts, thereby breaking the circuit over conductor 407 and opening the circuit of relay O50 permitting that relay to restore so that there will be but an even one hundred units registered in the hundreds register.

Assuming now that with an odd fifty units registered in the Fifty Register" and with wiper 401 engaging its second bank contact, as explained above, the second fifty units registration comes in over the switch TCR. The circuit previously traced over conductor 410 will be extended through contacts 425 on the tens carry relay TC, thence through normally closed contacts 412 and 413 through the winding of relay FC1 to operate FC1, thereby to initiate the operation of relay FC2 and the hundreds rotary magnet HR as before.

Simultaneous placing of fifty units values in hundreds register

Assume for the moment that there are zero units accumulated in the hundreds register, in which case the wipers of switches TCR, FR, and HR will all be in the position shown in Fig. 4. Assume now that a fifty-unit value is received over the tens carry channel and simultaneously a fifty-unit value is received over the FB channel. Tens carry relay TC will be operated and the relay FS will likewise be operated. A circuit may now be traced from positive through wiper 401 and an odd numbered contact, conductor 402, wiper 403, and an odd numbered contact, conductor 406, through contacts 426 closed by the operation of relay FS, contacts 427 closed by the operation of relay TC through normally closed contacts 412 and 413 through the winding of relay FC1 to negative, initiating the operation of relays FC1, FC2, and magnet HR as above, thereby to operate the hundreds rotary HR one step to register one hundred units in the register.

Registering one hundred units values

One hundred units values enter the adding machine over the one hundred units circuit HB, operating relay 100B in the manner explained in connection with the fundamental circuit explanation accompanying Fig. 1. Relay HS will be operated if both relays FC1 and FC2 are normal at the time; that is, if there is no transfer from the "Fifty Register" to the one hundred register at the moment. A circuit may then be traced from positive at 430, through contacts 431 and contacts 432, both normally closed and operated by relays FC2 and FC1, respectively, contacts 433 on relay 100B, through the winding of relay HS to negative. Relay HS operates over this circuit closing normally open contacts 434, thereby closing the obvious circuit for the magnet HR which energizes preparatory to advancing the switch HR one step, which advance is made when the magnet restores responsive to the breaking of the circuit through relay 100B.

Transfer to the thousands register

As soon as the hundreds register switch HR has completed nine steps to register nine hundred units values in the register, wiper 435 will be standing on its tenth bank contact 436. The receipt of an additional hundreds value will operate the thousands register, as well as the hundreds register, the circuit being extended through wiper 435 and contact 436, conductor 437, and thence over one of two paths depending on whether this one hundred units value enters the machine over the hundreds channel HB or comes through the fifty units carry channel through the operation of relay FC2. Assume that it comes over the hundreds channel, relay HS will be operated to close springs 438, thereby extending the circuit through the winding of the thousands register control relay THX to negative, operating that relay which locks itself through springs 439 and normally closed contacts 440 on the thousands rotary THR to positive. Relay THX closes contacts 441, thereby closing the magnet THR which is energized preparatory to advancing the wipers of the thousands rotary THR one step. Operation of HS will also complete the circuit for magnet HR, and when relay HS restores, both of the switches HR and THR will take one step to indicate one thousand units in the thousands rotary, and zero units in the hundreds rotary.

The ten-thousands and one-hundred-thousands values are registered in the machine by apparatus duplicating the thousands register THR, which apparatus has been omitted from the drawings to avoid an unnecessary complication thereof. When nine thousand units are registered in the switch THR, wiper 442 will be engaging its ninth bank contact 443 to which the control relay of the ten-thousands register, not shown, is connected over conductor 444. Upon the receipt of the next one hundred units value, the circuit extending through contacts 438 on the relay HS will extend through relay THX as before, and also over conductor 445, through wiper 442, contact 443, and conductor 444 to the ten-thousand units control relay, so that the hundreds register, the thousands register, and the ten-thousands register will all take one step to complete the register of this one hundred units value.

Indicator

The sums accumulated in the various registers are indicated by suitable indicators positioned so as to be readily visible at one or more desired points associated with the totalisator. Thus, for example, at a race track indications would ordinarily be displayed on an infield board visible from the grandstand and on one or more boards elsewhere about the track.

As will be seen in Fig. 1, indicators are associated with each of the adding machines, the indicator 150 associated with the total adding machine 100 serving to display the sums accumulated in that adding machine. Each of the individual adding machines of which 105 is an example likewise has an associated indicator 151 which displays the sums accumulated from tickets sold on that individual runner.

The indicators 150 and 151 in the example shown each consist of a bank of lamps 700, Fig. 7, preferably consisting of four lamps in each hori-

zontal row, and six rows placed one above the other vertically so that the indicator panel includes twenty-four lamps which are lighted in various combinations to indicate the value of one digit of the sum then accumulated in the adding machine. In the case of the total adding machine there will be a panel similar to 700 for the units digit, the tens digit, the hundreds digit, the thousands digit, the ten-thousands digit, and the hundred-thousands digit. In the individual adding machine indicator 151, the hundred-thousands digit ordinarily will be omitted.

Located upon the control panel of the totalisator system is a synchronous clockwork mechanism 500, driven from a source of alternating current indicated by the squares 501 and arranged to close a contact 502 at stated intervals, thereby completing the circuit for indicating relays IND. Two or more indicating relays are connected in multiple and each operated whenever contacts 502 are closed, each relay carrying a plurality of contacts by which the series of the various indicator lamps are controlled. Since the indicator relays IND operate simultaneously, they have the same effect as a single relay and are hereinafter referred to as a relay. Ordinarily the clockwork 500 will operate the relay IND at from ninety to one hundred twenty-second intervals so that the various amounts displayed on the display boards will remain there sufficiently long to permit accurate observation and at the same time will be changed with sufficient frequency that the amounts so indicated are up-to-date.

In Fig. 5, the indicator and control therefor, associated with the units digit of the sum to be displayed, are shown by way of example. The indicator lamps 1 to 24, inclusive, are controlled by five relays, I1, I2, I3, I4, and I5, two of which are operated simultaneously to form the various digits to be displayed. The register relays U0, 2, 4, 6, and 8, and the odd 5 relay O5, operate contacts which control the indicator relays I1 to I5, inclusive, in accordance with the sum then accumulated in the particular register operating two of the indicator relays.

In the event that the amount in the indicator at the moment that the indication is to be displayed is zero, indicator relays I3 and I4 will be operated to light lamps 2, 3, 8, 12, 16, 20, 23, 22, 17, 13, 9, and 5, thereby to form an arabic zero on the indicator panel 700. Since there are assumed to be zero units registered in the units register, relay U0 will be operated, the O5 relay will be in its normal position, and as soon as the timer 500 operates the relay IND circuits for relays I3 and I4 will be closed as follows: From positive at 510, through the normally closed contacts 511 controlled by the O5 relay, through contacts 512 on the U0 relay, conductor 513, through contacts 514 on the relay IND, through the winding of indicator relay I3 to negative, indicator relay I3 operating over this circuit and locking itself in operative position to positive at 515 through normally closed contacts 516 on the relay IND, conductor 517, through contacts 518 through the winding of relay I3 to negative. A circuit for relay I4 will be simultaneously completed through springs 511, springs 520 on the U0 relay, conductor 521, through contacts 522 on the relay IND, through the winding of relay I4 to negative, this relay operating and locking itself to positive on conductor 517 through contacts 523. A circuit for lamp 3 in the indicator panel 700 may now be traced from one side of a source of alternating current 525 through contact 526 closed by the operation of relay I3, conductor 527, through the lamp 3 to the other side of the source of alternating current on conductor 528.

A circuit branches off conductor 527 through normally closed contacts 529 on relay I1 through lamp 23 in the indicator panel to the opposite side of the source of alternating current, lighting lamp 23. A circuit for lamp 22 may be traced from a source of alternating current at 530, contacts 531 closed by the operation of relay I4, conductor 532, through the lamp 22 to the other side of the source of current, there being a branch of this circuit extending over conductor 533 through normally closed contacts 534 on relay I5, conductor 535, through lamp 20 to the other side of the source of alternating current. Lamp 5 is lighted over a circuit which may be traced from one side of the source of alternating current at 530, contacts 531 on relay I4, conductor 536, normally closed contacts 537 on relay I2, through lamp 5 to the other side of the source of current. Lamp 2 will be lighted from the source of alternating current at 540, contacts 541 closed by the operation of relay I3, conductor 542, through lamp 2 to the other side of the source of current. A branch leads off of conductor 542 through normally closed contacts 543 on relay I2, conductor 544, to light lamp 17. Lamp 16 is lighted over a circuit which may be traced from one side of the source of alternating current at 545, contacts 546 closed by the operation of relay I4, conductor 547, through lamp 16 to the other side of the source of alternating current.

Lamp 8 is lighted from the source of alternating current 548 through contacts 549 closed by the operation of relay I3, conductor 550, through lamp 8 to the other side of the source of current. Lamp 12 is lighted from the source of alternating current 551, contacts 552 closed by relay I3, contacts 553 closed by relay I4, conductor 554 through lamp 12 to the other side of the source of current. Lamp 9 is lighted from the source of current at 555, contacts 556 closed by relay I3, contacts 557 closed by relay I4, conductor 558 through lamp 9 to the other side of the source of current. Lamp 13 is lighted from the source of current at 559, contacts 560 closed by relay I4, normally closed contacts 561 on relay I2, conductor 562 through lamp 13 to the other side of the source of current.

The digits which the indicator 700 is capable of displaying are formed in accordance with the following table by operating the specified relays:

Digit	Relays	Lamps
0	3 and 4	2, 3, 8, 12, 16, 20, 23, 22, 17, 13, 9, and 5.
1	1 and 5	3, 7, 11, 15, 19, and 23.
2	3 and 5	5, 2, 3, 8, 11, 14, 17, 21, 22, 23, and 24.
3	2 and 3	1, 2, 3, 4, 8, 11, 16, 20, 23, 22, and 17.
4	1 and 2	3, 7, 11, 15, 19, 23, 16, 14, 13, 9, and 5.
5	2 and 5	4, 3, 2, 1, 5, 9, 10, 11, 16, 20, 23, 22, and 17.
6	1 and 4	3, 2, 5, 9, 13, 17, 22, 23, 20, 16, 11, and 10.
7	1 and 3	1, 2, 3, 4, 8, 11, 14, 17, and 21.
8	4 and 5	2, 3, 8, 11, 16, 20, 23, 24, 17, 13, 10, and 5.
9	2 and 4	2, 3, 8, 11, 12, 16, 20, 23, 22, 10, and 5.

Digit 1 will be displayed in the units indicator when at the moment the indication is taken off of the registers there is an odd five registration in the tens register and six units in the units register. Relays I1 and I5, which must be operated to form the digit 1, are operated over circuits which may be traced from positive at 565, contacts 566 closed by the O5 relay, contacts 567

closed by the units relay 6 in the units register, conductor 568, contacts 569 on relay IND, through the winding of relay I5 to negative, operating that relay which locks itself through contacts 570 to positive on conductor 517. Relay I1 is operated over a circuit from positive at 571, contacts 572 on the units relay 6, conductor 573, contacts 574 on relay IND, through the winding of relay I1 to negative, operating this relay which locks itself through contacts 575 to positive on conductor 517. Relays I1 and I5, through their respective contacts, close circuits for the six lamps required to form the digit 1. Tracing of these circuits is not deemed to be necessary.

Digit 2 will be displayed when, at the moment the indication is taken off of the registers, there is no odd five registration in the tens register and there is a two units registration in the units register, the circuits for relays I3 and I5 necessary to form this digit being traceable from positive at 571 through contacts 576 on the units relay 2, contacts 514 on relay IND, through the winding of relay I3 to negative, this relay operating and locking itself through contacts 518 to the conductor 517. The circuit for relay I5 is completed from positive at 510, normally closed contacts 511, contacts 577 on the units relay 2, conductor 568, through contacts 569 on relay IND, through the winding of relay I5 to negative, this relay operating and locking itself through contacts 570 to positive on conductor 517.

The digit 3 will be displayed in the units register when there is an odd five registration in the tens register, and eight units in the units register, relays I2 and I3 being operated to form this digit over circuits traceable from positive at 565, through contacts 566 on the O5 relay, contacts 578 on the units relay 8, conductor 579, contacts 580 on relay IND, through the winding of relay I2 to negative, this relay operating and locking itself through contacts 581 to positive on conductor 517. The circuit for relay I3 extends through contacts 582 on the units relay 8, conductor 583, contacts 514 on relay IND, through the winding of I3 to negative, operating this relay which locks through contacts 518 to positive on conductor 517. Relays I2 and I3 jointly control the lighting of the lamps required to indicate the digit 3.

The digit 4 will be displayed when there is no odd five registration in the tens register and four units are accumulated in the units register, the circuits for relays I1 and I2 required to form this digit being traceable from positive at 510 through contacts 511, contacts 584 on the units relay 4, contacts 574 on relay IND, through the winding of relay I1 to negative, this relay operating and locking itself through contacts 575 to conductor 517. The circuit for relay I2 extends from positive at 571, contacts 585, conductor 579, contacts 580 on relay IND, through the winding of the relay to negative, the relay operating and locking through contacts 581 to positive on 517, as before.

Digit 5 will be displayed when there is an odd five in the tens register and zero in the units register, relays I2 and I5 being operated to form this digit. Relay I2 will be operated by positive placed on conductor 579, through contacts 586; and relay I5 from positive placed on conductor 568 through contacts 587, both circuits being completed through contacts 566 on the O5 relay to positive at 565.

Digit 6 will be displayed when there are six units in the units register and no O5 registration in the tens register, relays I1 and I4 required for this registration being operated over a circuit through normally closed contacts 511 on the O5 relay, contacts 588 on the relay 6, conductor 521, contacts 522, through the winding of relay I4; and relay I1 being operated from positive placed on conductor 573 through springs 572, as before.

Digit 7 will be displayed when there are two units in the units register and an odd five in the tens register, relay I3 being operated over the previously traced circuit through contacts 576, and relay I1 being operated over positive placed on conductor 573 through contacts 589 on the units relay 2, through contacts 566 on the O5 relay.

Digit 8 will be displayed when there are eight units in the units register and no odd five registration in the tens register. Relays I4 and I5 are operated to form this digit, relay I5 being operated from positive placed on conductor 568 through contacts 589 and 511, and relay I4 being operated by positive placed on conductor 521 through contacts 590 and 511.

Digit 9 will be displayed when there are four units in the units register and an odd five registration in the tens register, relays I2 and I4 being operated to form this digit. Relay I2 is operated by positive placed on conductor 579, through contacts 585, and relay I4 being operated by positive placed on conductor 521 through contacts 591 and 566.

The tens digit indication control

The indications of the tens digit of the sum are displayed through an indicator which duplicates the units indicator and is controlled by five relays which duplicate the control relays of the units indicator. These relays T1, T2, T3, T4 and T5, and the circuits over which they are controlled, are shown in Fig. 6. These circuits are controlled by the register relays T0, 10, 20, 30, and 40 in the tens register, by the O5 relay, and by the O50 relay. The relays T1 to T5, inclusive, upon operating, close contacts which extend circuits to the various lamps in the indicator panel in precisely the same manner as in the units indicator, which contacts and connections have been omitted from Fig. 6 to avoid an unnecessary duplication in the drawings.

Zero will be displayed in the tens digit indicator when the only registration therein is the O5 relay indicating a five units value and when the O50 relay is unoperated and the T0 relay is operated. Zero will likewise be displayed when the odd five relay is at normal and register relay T0 is operated. As explained in the table in the description of the units register, the digit zero is displayed when the relays I3 and I4 are operated. Assume first that the T0 relay is the only relay operated at the moment the indication is taken off. A circuit may be traced from positive at 601 through parallel branches, the one extending through normally closed contacts on the O5 relay and the other through normally closed contacts on the units register relays 6 and 8, conductor 602, normally closed contacts 603 on the O50 relay, contacts 604 closed by the T0 relay, conductor 605, contacts 606 on relay IND, through the winding of T4 to negative, to operate that relay which locks itself in a manner identical with the locking circuit of relays I1 to I5, inclusive. A circuit may also now be traced from positive at 607 through a similar parallel path through normally closed contacts on the O5, and relays 6 and 8, conductor 608, normally closed

contacts 609 on the O50 relay, contacts 610 on the T0 relay, conductor 611, through contacts 612 on relay IND, through the winding of T3 to negative, operating relay T3.

In the event that the O5 relay is operated, these circuits for relays T3 and T4 will extend only through the normally closed contacts on relays 3 and 6 of the units register, but otherwise will be as above.

The digit 1 in the tens register will be displayed when the O5 relay is operated, and when either the units relays 6 or 8 of the units register are operated and the O50 relay is normal. Digit 1 will be displayed when the O5 relay is operated and the relay 10 in the tens register is operated, and also when relay 10 is operated and relay O5 is at normal. Assume first that the O5 and unit relay 6 are operated, and that there are no other values in the tens register, in which case relay T0 will likewise be operated. Relays I1 and I5 will be operated to form the digit 1 over circuit traceable from positive at 613, contacts 614, on the unit relay 6, contacts 615 on the O50 relay, conductor 616, contacts 617 on the O50 relay, contacts 618 on the T0 relay, conductor 619, contacts 620 on relay IND, through the winding of relay T5 to negative; and from positive at 620, contacts 621 on the unit relay 6, contact 622 on the O5 relay, conductor 623, contacts 624 on the O50 relay, contacts 625 on the T0 relay, conductor 626, through contacts 627 on relay IND, through the winding of T1 to negative. These relays will operate and lock, as hereinbefore explained. In the event that the relay 10 in the tens register is the only one operated, positive will be placed on conductor 626 from the previously traced circuit from 607, through springs 609 on the O50 relay, contact 628 on relay 10 to conductor 626. Positive will be placed on conductor 619 from the previously traced circuit beginning at 601 and extending through contact 603, through contact 629 on the relay 10, to conductor 619.

The foregoing will serve as examples of how T1 to T5 are operated under the joint control of the tens register relays, the units register relays 6 and 8, the O5 relay, and the O50 relay, to cause relays T1 to T5 to operate and display the digit required to properly indicate the sum registered in the registers at the moment the indication is taken off. Further description of the operation of the tens register indicator is not deemed necessary herein, as it will be merely a repetition of the foregoing, altered to meet the conditions imposed by the digit to be displayed.

The hundreds digit indication

The hundreds digits of the sums accumulated in the totalisator are displayed by an indicator duplicating that shown in Fig. 7, which indicator is controlled by five relays duplicating the control relays of the units and tens register. The circuits to these hundreds digit control relays, however, are extended directly from the banks of the hundreds register switch HR rather than through relay contacts, as in the units and tens register. In Fig. 4 these circuits are shown. Relay H1 will be operated responsive to the operation of the relay IND, through wiper 450 on the hundreds rotary HR, when that wiper is engaging its second bank contact to which conductor 451 is connected, and also when wiper 450 engages the fifth, seventh and eighth contacts in its bank, to which conductor 451 is also connected. A circuit may be traced from positive at 452 through any bank contact in the bank engaged by wiper 453 except the number one contact therein, through contacts 454 on relay IND, wiper 450, conductor 451, through the winding of relay H1 to negative. As will be seen in the foregoing table, relay H1 is operated when the digit to be displayed is 1, 4, 6, or 7.

Relay H2 will be operated through wiper 450 when that wiper engages 610 bank contact to which conductor 455 is connected, and this relay will also be operated through contacts 456 and wiper 457 when that wiper engages the fourth, fifth, and sixth contacts in its bank, to which conductor 455 is likewise connected.

Relay H3 will be operated through wiper 450 when that wiper is engaging the first, third and fourth contacts in its bank, to which conductor 458 is connected, and also through wiper 457 when that wiper is engaging its eighth bank contact to which conductor 458 is also connected.

Relay H4 will be operated when wiper 457 engages its first bank contact, to which conductor 459 is connected, and also when that wiper engages its seventh, ninth, and tenth contacts to which conductor 459 is also connected.

Relay H5 will be operated through wiper 450 when that wiper engages its sixth and ninth bank contacts to which conductor 460 is connected, and also operated through wiper 457 when that wiper engages its second and third bank contacts to which conductor 460 is also connected.

When the wipers of switch HR are engaging the first bank contact, as shown in Fig. 4, and the wipers of the thousands register switch THR and succeeding switches are likewise in their first or home position, operation of contacts 454 and 456 on relay IND will not extend positive to any of the relays H1 to H5, inclusive, and there will be no indication in the hundreds register. This will occur in the early stages of operation when the sum accumulated in the adding machine does not yet equal one hundred units.

The thousands register

The thousands register and control therefor duplicate the hundreds register, and control is effected through wipers 470 and 471 of the thousands rotary switch THR. Since these circuits are identical with those of the hundreds register, they have been omitted from the drawings to avoid an unnecessary complication thereof.

Preliminary indication

In certain instances, in order that the indicators will properly indicate the sums accumulated in the adding machine, it will be necessary to operate the hundreds register preliminary to and before a normal transfer to this register is in order. Thus, for example, if at the moment the indication is taken off there is an odd fifty registration in the fifty register, an odd five registration in the tens register, and also forty units registered in this register, the sum of these values will equal 95; and if either the units register relay 6 or the units register relay 8 is in operated position, this odd value sum will exceed one hundred and the hundreds rotary HR will be operated over circuits shown in Figs. 3 and 4. Since under the conditions assumed relay 40 in the tens register is operated, there will be positive on the conductor 330 which will be extended over conductor 380 to either contact 381 on the units relay 6 or contacts 382 on the units relay 8, one of which is operated under the conditions assumed, contacts

383 on the O5 relay, contacts 384 on the O50 relay, to conductor 385.

In the timing device 500, Fig. 5, are contacts 563 which are closed momentarily just before main contacts 502 are closed. Contacts 563 close the obvious circuit for the preliminary indication relay PIND, operating that relay. Relay PIND closes contacts 386, Fig. 3, extending the positive on conductor 385, through normally closed contacts 475, Fig. 4, on the PI2 relay, through the winding of relay PI1 to negative, operating relay PI1. This relay closes a circuit from positive at 476, through contacts 477 on the PI1 relay through the winding of PI2 to negative, operating PI2, which locks itself through contacts 478, 479, and 480 to positive at 476. Operation of relay PI1 will close a circuit from positive on conductor 410, which conductor will carry positive since relay O50 is operated under the conditions assumed, contacts 481, through the winding of relay FC1 to negative, operating relay FC1, which closes contacts 420, thereby closing the previously traced circuit from positive at 417 through the winding of relay FC2 to negative, operating relay FC2, which closes contacts 423, thereby to step the rotary switch HR one step to register therein the one hundred units made up of the odd values mentioned.

With relay PI2 locked up as above, the next pulse which normally would operate FC1 and FC2 to effect a carry to the hundreds register, will be diverted, inasmuch as contacts 412, through which the circuit over which this pulse travels is extended as hereinbefore explained, will be opened. Assume for the moment that the next transfer to the hundreds register comes in over the fifty channel and that relay FB and FS are operated, contacts 411 will be closed and the circuit will be extended through contacts 482 through the winding of relay PI3 to negative, operating PI3 which opens contacts 413, to insure that relay FC1 will not operate, and unlocks relay PI2 by opening contacts 479. Relay PI3 locks itself through contacts 483 and contacts 411 to insure that it will remain in operating position so long as the pulse remains on conductor 410. As soon as this pulse goes off, indicating the completion of an attempt to transfer to the hundreds register, relay PI3 restores, so that the next transfer to the hundreds register will go through in the normal manner.

It will be noted that the preliminary operation of the hundreds register switch HR occurs just prior to an operation of the indicator relay IND. It follows then that this preliminary operation of HR will facilitate an accurate indication of the hundreds digit of the sum accumulated regardless of the fact that the various lesser value registers, in which parts of the odd values sum are accumulated, have not reached a transfer value.

So long as the indicator relay IND remains operated the various indicator relays, such as I1—I5, for example, will be maintained operated over the circuit over which they were operated. When relay IND restores contacts 516 close before the other contacts on the relay open and positive will be placed on the locking conductors, such as 517, to maintain the operated indicator in operated position, thereby to maintain the digits indications until the beginning of the next indication cycle.

Reset

At the beginning of each series of operations to be registered and indicated by the totalisator, the various stepping switches and relays must be restored to a normal position so that the first indication given before any transactions are registered will consist only of zeros. To this end, a manually controlled switch, not shown, is closed by the attendant, thereby to operate one or more reset relays, not shown, to close the reset contacts RST appearing throughout the figures herein. Since the number of contacts RST to be operated exceeds the number that can be carried by a single relay, a plurality of reset relays are provided and operated in multiple which electrically is the same as a single relay.

The operation of the reset relay restores the units register by closing contacts 270, 271, 272 and 273. If the switches 2R1, 2R2, and 2R3 are in such positions as to extend a circuit to relay 2, 4, 6, or 8, closing of these contacts 270 to 273, inclusive, will place positive on conductor 274, thereby extending a circuit through normally closed contacts 275 on the rotary switch 2R1, through the winding of magnet 2R1 to negative, operating that magnet which interrupts its own circuit by opening contacts 275, and restores to advance the wipers one step. If positive is still present on conductor 274, the magnet will continue to operate in buzzerlike fashion until wiper 211 engages a contact through which a circuit is extended to relay U0 rather than any one of the other relays in the register, and positive will be removed from conductor 274 and the switch will come to rest with the units register at zero position. It will be noted that switches 2R2 and 2R3 are not restored to normal position, but rather remain in the position last used to start the succeeding series of registrations from this position.

The tens register is restored to normal by closing of reset contacts RST387, 388, 389, 390, and 391, to which conductors 332, 311, 316, 325, and 330 are connected. If the wipers of switches 5R, 2CR, and 10R are in such position that either relay 10, 20, 30, or 40 is in operated position, positive will be placed on conductor 392 and will extend through normally closed contacts 393 on the five units rotary 5R, through the winding of the magnet 5R to negative, operating that magnet which interrupts its own circuit by opening contacts 393. The magnet restores and advances the wipers of switch 5R one step, and if positive is still present on conductor 392 this operation will be repeated. As soon as the wipers of switch 5R reach a contact through which a circuit is extended to the T0 relay and is not simultaneously extended to the O5 relay, the positive on conductor 392 will be removed and the switch will come to rest with the tens register at zero. Switches 2CR and 10R are not reset, but rather will commence the next series of registrations from the position in which they are located at the conclusion of the previous series.

Closing the reset contacts 446 and 447 will complete a circuit from positive on wiper 401 on switch TCR, conductor 408, conductor 394, normally closed contacts 348 on this switch, contacts 447, through the winding of the magnet TCR to negative, operating that magnet which interrupts its own circuit by opening contacts 348. The magnet restores and advances the wipers 401 one step, thereby to open the circuit just traced and the fifty units register is thus restored to normal.

The hundreds units register is restored when the reset relay is operated over a circuit which may be traced from positive at 417, normally

closed contacts 418 on the hundreds rotary switch, wiper 490, any contact of the bank of this wiper 490, except the number one contact, contacts 491 on the reset relay, through the winding of magnet HR to negative, this magnet operating its own circuit by opening contact 418 to advance the wipers of switch HR step-by-step until the wipers reach the position in which they are shown in Fig. 4.

The thousands and ten-thousands rotary switches are restored to normal in a manner identical with that of the hundreds rotary HR.

From the foregoing, it will be apparent that the registers of the adding machine of the present invention are each capable of accepting a plurality of transactions simultaneously and registering those transactions without interference one with the other. Transfers are made from a lower register to a higher register when necessary, and at the moment of transfer one of the channels leading into the register that is making the transfer is momentarily disabled so as to prevent a transaction received over that channel from interfering with the transfer. Through this arrangement, registrations can be received at very high speed and accumulations in the adding machines made with accuracy. The fundamental control circuits are operated on a wider margin between maximum and minimum current values, thereby to permit a wider latitude of adjustment of the relays to further enhance speed without sacrificing accuracy.

While I have chosen to illustrate my invention by showing and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes, and shown and described a preferred embodiment of my invention, what I consider new and desire to have patented by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a totalisator system adding machine; a tens register in which tens values are accumulated; a hundreds register in which fifty and hundred units values are accumulated; a tens carry relay; means including said tens carry relay for effecting a transfer to the hundreds register; a ten units value channel leading into said machine; means including a tens channel relay that is operated upon the receipt of a ten units value over said channel for operating said tens register to register said value therein; and a circuit for said tens channel relay extending through normally closed contacts on said tens carry relay, said contacts being opened by an operation of the tens carry relay to prevent an operation of only the ten units channel relay during a transfer to the hundreds register.

2. In a totalisator system adding machine; units register relays operable to register zero, two, four, six, and eight units respectively; a plurality of independent channels leading into said adding machine; a stepping switch for each channel; a single set of contacts on one of said switches; a plurality of sets of contacts on the other switches; a wiper for each set of contacts, which wiper steps sequentially over the contacts as the switch steps; circuit connections between the contacts of each one of said switches and the wipers of a succeeding switch and between the contacts of the last one of said switches and said register relays, over which connections one of said relays is operated to register the units then accumulated in the adding machine; a magnet for each stepping switch; a relay for each channel operated when a value is received over that channel; a circuit for each magnet closed by the associated channel relay in operated position to operate the magnet and thereby step the associated switch one step, the wipers of said switch opening the circuit of the register relay then energized and closing a circuit to the register relay for the next higher value thereby to register that value in the adding machine, a reset relay; and circuit means closed by said reset relay to the magnet of said single wiper switch over which circuit the switch is operated until a circuit is closed to the zero register relay, thereby to reset the register to zero.

3. In a totalisator system adding machine; units register relays operable to register zero, two, four, six and eight units respectively; three independent channels leading into said adding machine; a stepping switch for each channel; a single set of contacts on one of said switches; a plurality of sets of contacts on the other switches; a wiper for each set of contacts, which wiper moves sequentially over the contacts as the switch steps; circuit connections between the contacts of a first one of said switches and the wipers of a second one of said switches; circuit connections between the contacts of said second switch and the wipers of a third one of said switches; circuit connections between the contacts of said third switch and said register relays; means for completing a circuit through said wipers, contacts and connections to one of the register relays to operate that relay to register the units then accumulated in the adding machine; a relay for each channel energized when a value is received over that channel; a magnet for each stepping switch; a circuit for each magnet closed by the associated channel relay in energized position to operate the magnet and thereby step the associated switch one step; the wipers of said switch opening the circuit of the register relay then energized and closing a circuit to the register relay for the next higher value thereby to register that value in the adding machine.

4. In a totalisator system adding machine; units register relays operable to register zero, two, four, six, and eight units respectively; a plurality of stepping switches; wipers in each switch; a bank of contacts over which an associated wiper steps as the switch steps; circuit connections between the contacts of each switch and the wipers of a succeeding switch and between the contacts of the last one of said switches and said register relays; means for closing a circuit through said wipers and connections to one of said register relays to operate that relay to register the units value then accumulated in the adding machine; means including a relay for each switch for stepping that switch thereby to open the circuit of the register relay then energized and close a circuit to the register relay for the next higher value thereby to operate that relay to register that value; a tens register; a carry relay operable to transfer to the tens register values of ten units accumulated in the units register; a circuit for said carry relay paralleling said eight units relay and closed by contacts on any one of said stepping switch relays to operate the carry relay simultaneously with any one of the switches

when eight units have been accumulated; a second circuit for said carry relay paralleling said six units relay and closed by contacts on any two of said stepping switch relays to operate the carry relay simultaneously with any two of the switches when six units have been accumulated; and a third circuit for said carry relay paralleling said four units relay and closed by contacts on three of said stepping switch relays to operate the carry relay simultaneously with the three switches when four units have been accumulated in the units register.

5. In a totalisator system adding machine; units register relays operable to register zero, two, four, six and eight units respectively; a plurality of independent channels leading into said adding machine; a stepping switch for each channel; a single set of contacts on one of said switches a plurality of sets of contacts on the other switches; a wiper for each set of contacts, which wiper steps sequentially over the contacts as the switch steps; circuit connections between the contacts of each one of said switches and the wipers of the succeeding switch and between the contacts of the last switch and said register relays; means for completing a circuit through said wipers and circuit connections to one of said register relays to operate that relay to register the units value then accumulated in the adding machine; a magnet for each stepping switch; a relay for each channel operated in response to the closing of a circuit over said channel; a circuit for each magnet closed by the associated channel relay in operated position to operate the magnet and thereby step the associated switch one step, the wipers of said switch opening the circuit of the register relay then energized and closing a circuit to the register relay for the next higher value thereby to operate that relay to register that value in the adding machine; a tens register in said adding machine; a carry relay; a circuit for said carry relay completed when the units registration equals ten to operate that relay thereby to register ten in said tens register; and contacts on said carry relay opened by said carry relay in operated position and included in the circuit of one of said channel relays for opening the circuit of only one of said channel relays thereby to prevent an operation of that relay and stepping switch while said carry relay is making a transfer to said tens register.

6. In a totalisator system adding machine; a units register operable to register zero, two, four, six, and eight units, a plurality of stepping switches having wipers and banks of contacts over which the wipers step as the switch steps; connections between the contacts of one switch and the wipers of the succeeding switch and between the contacts of the last switch and the units register; means for closing a circuit over said connections to operate said register to register the units value then accumulated in the machine; a relay for each stepping switch operated when a unit value is received in the machine; a circuit for each stepping switch closed by the associated relay in operated position to operate that switch and thereby reoperate the register to add the units value therein; a tens register; a carry relay operable to transfer values to the tens register when the sum in the units register equals ten; circuits for said carry relay controlled jointly by said switches and associated relays and closed when ten units are registered in the units register to operate the carry relay to effect a transfer to the tens register; and contacts opened by the carry relay in operated position and included in the circuit of only the relay associated with the last one of said stepping switches to prevent an operation of that switch during a transfer effected by said carry relay.

7. The combination with a plurality of electrical devices operable together in combinations of three, of control means therefor comprising a high sensitivity relay in each of two devices of the combination, a low sensitivity relay in the third device of the combination, a resistor in one of said two devices, means for establishing a series circuit through said three relays and resistor, means for energizing said circuit to operate the two high sensitivity relays thereover to control the associated devices, normally open contacts in two of said devices closed by the device moving into operated position, and a circuit extending through said closed contacts in series for short-circuiting said resistor to increase the current flow in said circuit thereby to operate said low sensitivity relay to control the associated device.

8. In a totalisator system, a total adding machine, an individual adding machine, a high sensitivity relay in each adding machine, a ticket machine, a low sensitivity relay in said ticket machine, a resistor, a collector, means including said collector for establishing a series circuit through said resistor and said three relays, means for energizing said circuit to operate the high sensitivity relays, a register in said total adding machine, means responsive to an operation of said associated high sensitivity relays for operating said register, contacts closed by said register, contacts closed by said high sensitivity relay; a register in said individual adding machine, means responsive to an operation of said associated high sensitivity relay for operating said register, contacts closed by said latter register, contacts closed by said latter high sensitivity relay, means including a circuit closed by the contacts in said individual and total adding machines for short-circuiting said resistor thereby to increase the current flow in said series circuit to operate said low sensitivity relay thereby to control said ticket machine, and contacts opened by said low sensitivity relay for opening said series circuit.

9. In a totalisator system adding machine; a tens register including a relay for zero, ten, twenty, thirty, and forty units values; three stepping switches having banks of contacts and wipers that are moved from contact to contact as the switches step; connections between said contacts and wipers and relays; means for closing a circuit over said connections to operate said relays one at a time to register the value then accumulated in the register; a five unit channel leading into said machine; means including a channel relay operated when a five unit value is received over said channel for operating a first one of said stepping switches through one step; a units register; a carry relay in said units register operated when the value accumulated therein equals ten units; means controlled by said carry relay for operating a second one of said stepping switches through one step; a ten units channel leading into said machine; a tens channel relay operated when a ten units value is received over said tens channel for operating the third stepping switch through one step;

a hundreds register; a tens carry relay operable when the value accumulated in the tens register equals fifty units to transfer that accumulation to the hundreds register; a connection branching off of the circuit to the twenty units relay in the tens register and extending to a first wiper in the first of said switches; an odd five units relay in said register; a circuit for said odd five relay completed through the even contacts in a second row of the bank of said first switches and the wiper engaged thereby to operate the odd fives relay to register an odd five units value; and a circuit for said tens carry relay completed through said first wiper and the even contacts engaged thereby, and normally open contacts on the fives channel relay, the tens channel relay and the units carry relay when twenty-five units are accumulated in the tens register and values are simultaneously received over the fives and tens channels and the units carry channel to operate the tens carry relay and effect the transfer of fifty units to the hundreds register.

10. In a totalisator system adding machine; a tens register, a relay in said register operable to register forty units in said machine; means for operating said relay when the sum accumulated in said register equals forty units; a five unit channel leading into said machine; a stepping switch; a relay associated with said stepping switch; means for operating said relay responsive to the receipt of a five unit value in said machine; means operated by said associated relay in operated position for operating said switch to take one step, thereby to register an odd five units value in said machine; a hundreds register; a carry relay operable when the value accumulated in said tens register equals fifty units; a wiper on said switch; a plurality of contacts engaged sequentially by said wiper as the switch steps, said wiper engaging an even numbered contact when an odd five unit value is registered in the machine; a direct connection from said forty units relay to said wiper; a connection extending from the even numbered ones of said contacts through normally open contacts on the relay associated with said stepping switch to said carry relay, a circuit closed over said connections, when said wiper is engaging an even numbered contact and said associated relay is operated upon the receipt of a second five units value in said machine, to operate said carry relay in parallel with said forty units relay and thereby effect a transfer of fifty units to said hundreds register.

11. In a totalisator system adding machine; a tens register; a relay in said register operable to register thirty units in said machine; means for operating said relay when the sum accumulated in said register equals thirty units; a five units channel leading into said machine; a stepping switch associated with said channel; a tens units channel leading into said machine; a stepping switch associated with said tens units channel; a relay associated with each of said channels and its associated stepping switch; means for operating the five units channel relay responsive to the receipt of a five units value in the machine; means operated by said five units relay for operating the associated stepping switch through one step thereby to register a five units value in said machine; a hundreds register; a carry relay operable when the value accumulated in said tens register equals fifty units; means for operating the ten units channel relay responsive to the receipt of a ten units value in the machine; a wiper on said five units switch; a plurality of contacts engaged sequentially by said wiper as the switch steps, said wiper engaging an even numbered contact when an odd five unit value is registered in the machine; a direct connection from said thirty units relay to said wiper, a connection from the even numbered ones of said contacts through normally open contacts on said five and ten units channel relays to said carry relay, a circuit closed over said connections when said thirty units relay is energized, and said wiper is engaging an even numbered contact and the five and ten units channel relays operate simultaneously in response to the receipt of a second five units value and a ten units value, respectively, in said machine to operate said carry relay in parallel with said thirty units relay and thereby effect a transfer of fifty units to said hundreds register.

12. In a totalisator adding machine, a tens register in which the tens digit of the sum accumulated in the machine is registered; a hundreds register; a switch in said hundreds register operable through one step to register fifty units in the register, a relay in the tens register operated when the sum in that register equals fifty units to operate said switch through one step; a second switch in said hundreds register operable through one step to register fifty units in the register; a fifty units channel leading into the machine; a relay operated when a fifty units transaction is received over said channel to operate said second switch through one step to register fifty units; an odd fifty units relay; a circuit for said fifty units relay controlled jointly by said switches and closed when one fifty units value is in the register; a hundred units switch in said hundreds register operable through one step to register one hundred units; a hundred units channel leading into said machine; a relay operated when a one hundred units value is received over said hundreds channel to operate said hundreds switch one step; a pair of transfer relays; a circuit for said transfer relays controlled jointly by said fifty units switches and closed each time one hundred units are placed in the fifty register; circuit means controlled by said transfer relays in operated position and over which said hundreds switch is operated through one step to transfer said hundred units from the fifty to the hundreds register; and contacts opened by said transfer relays and included in the circuits of said fifties and hundreds channel relays to prevent an operation of those relays during said transfer.

ARTHUR J. JOHNSTON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,319,215	Foote	Oct. 21, 1919
2,032,972	Black et al.	Mar. 3, 1936
2,167,513	Johnston	July 25, 1936
2,182,875	Levy	Dec. 12, 1939
2,261,686	Kesselring	Nov. 4, 1941
2,362,021	Nazar	Nov. 7, 1944

FOREIGN PATENTS

Number	Country	Date
419,600	Great Britain	Nov. 12, 1934

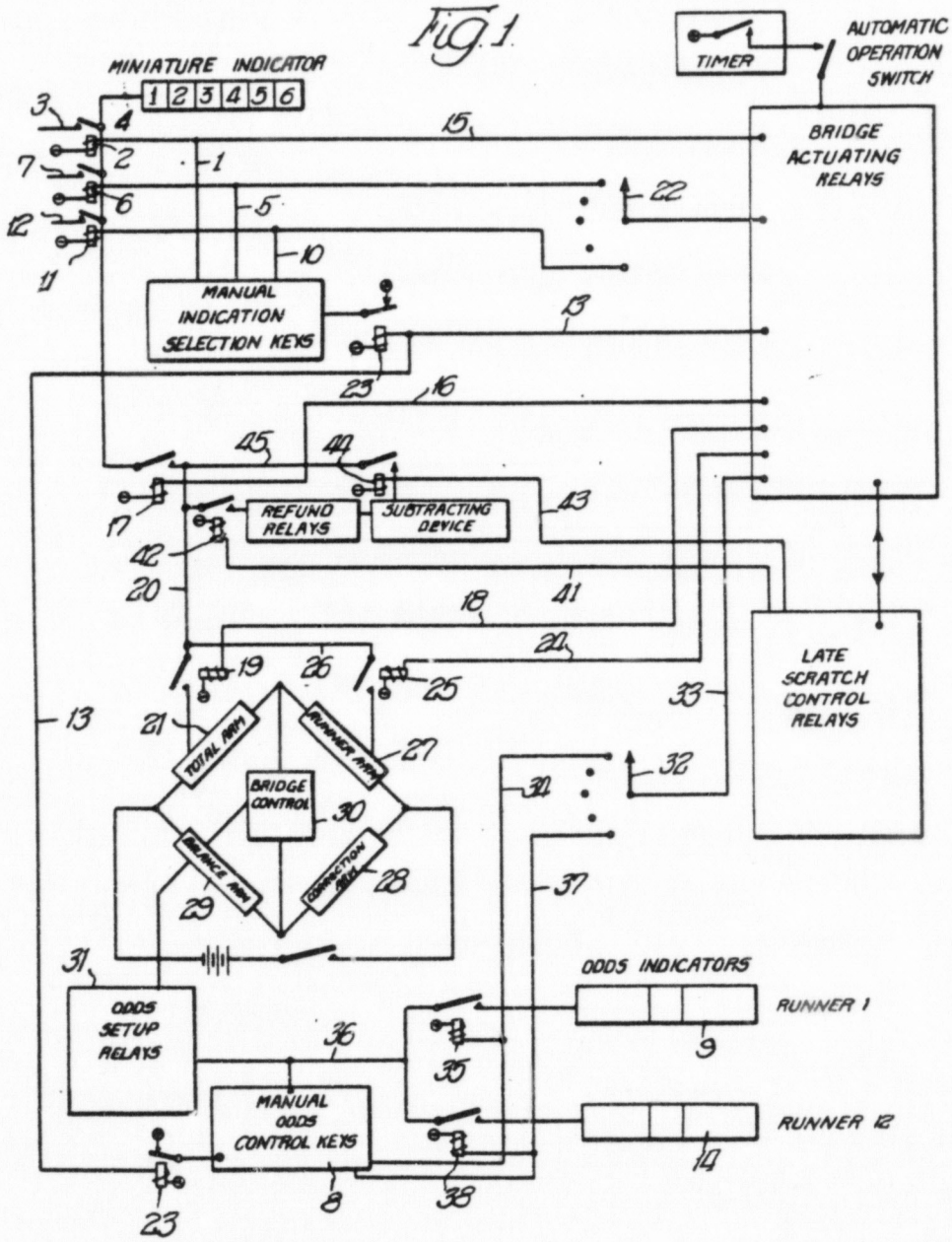
A590

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 1

Fig. 1



INVENTOR.
Oscar C. Levy,
BY
George H. Simmons
Atty

GOVERNMENT

justed. At the end of this interval, relay 207 re-

first runner odds indicator 9. Operation of relay

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 2

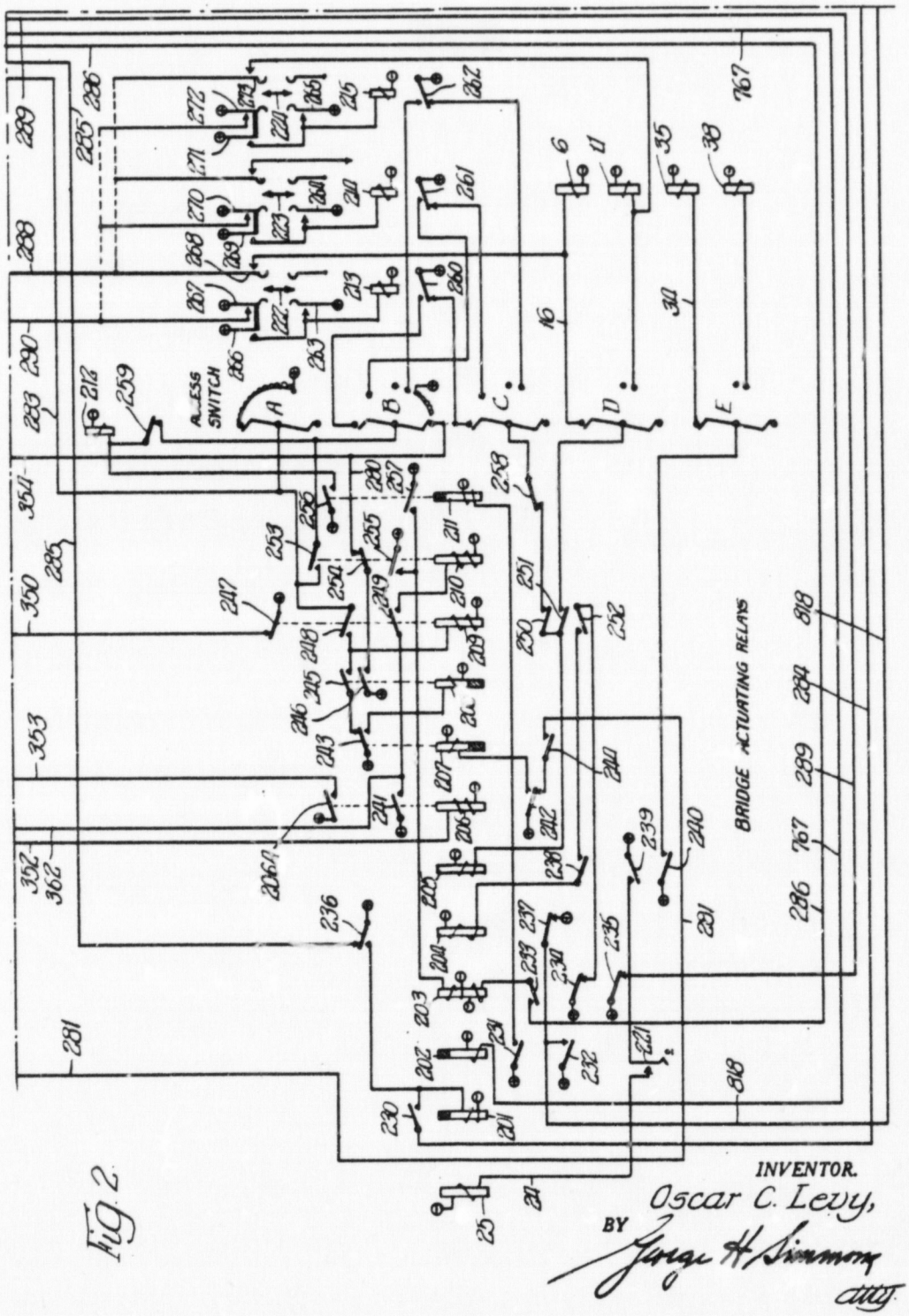


Fig. 2.

INVENTOR.
Oscar C. Levy,
BY
George H. Simmons
Atty.

A592

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 3

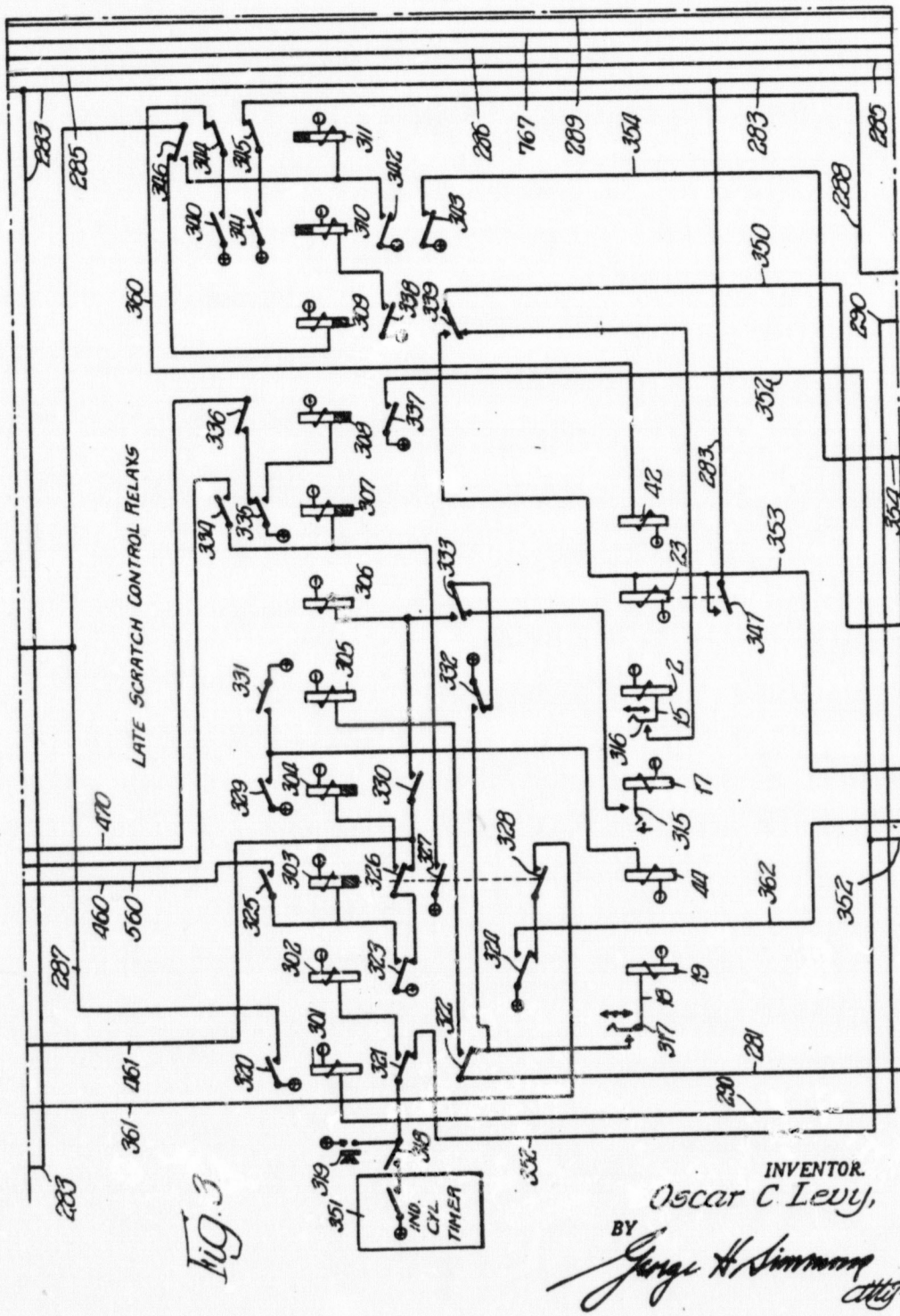


Fig. 3

INVENTOR.
Oscar C Levy,
BY
George H. Simmons
Atty

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 4

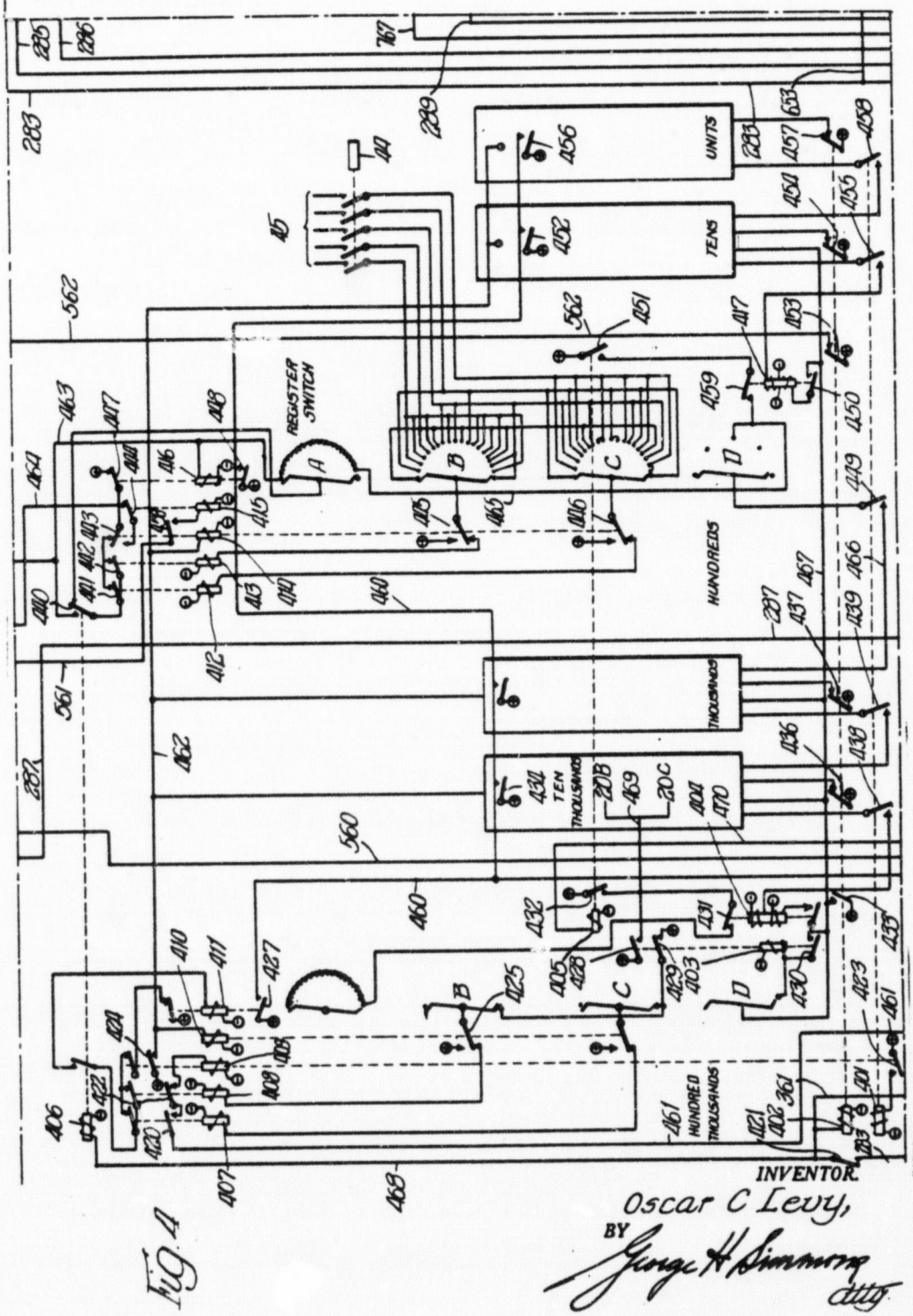


Fig. 4

INVENTOR.
Oscar C Levy,
BY George H Simmons
Atty.

A594

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 5

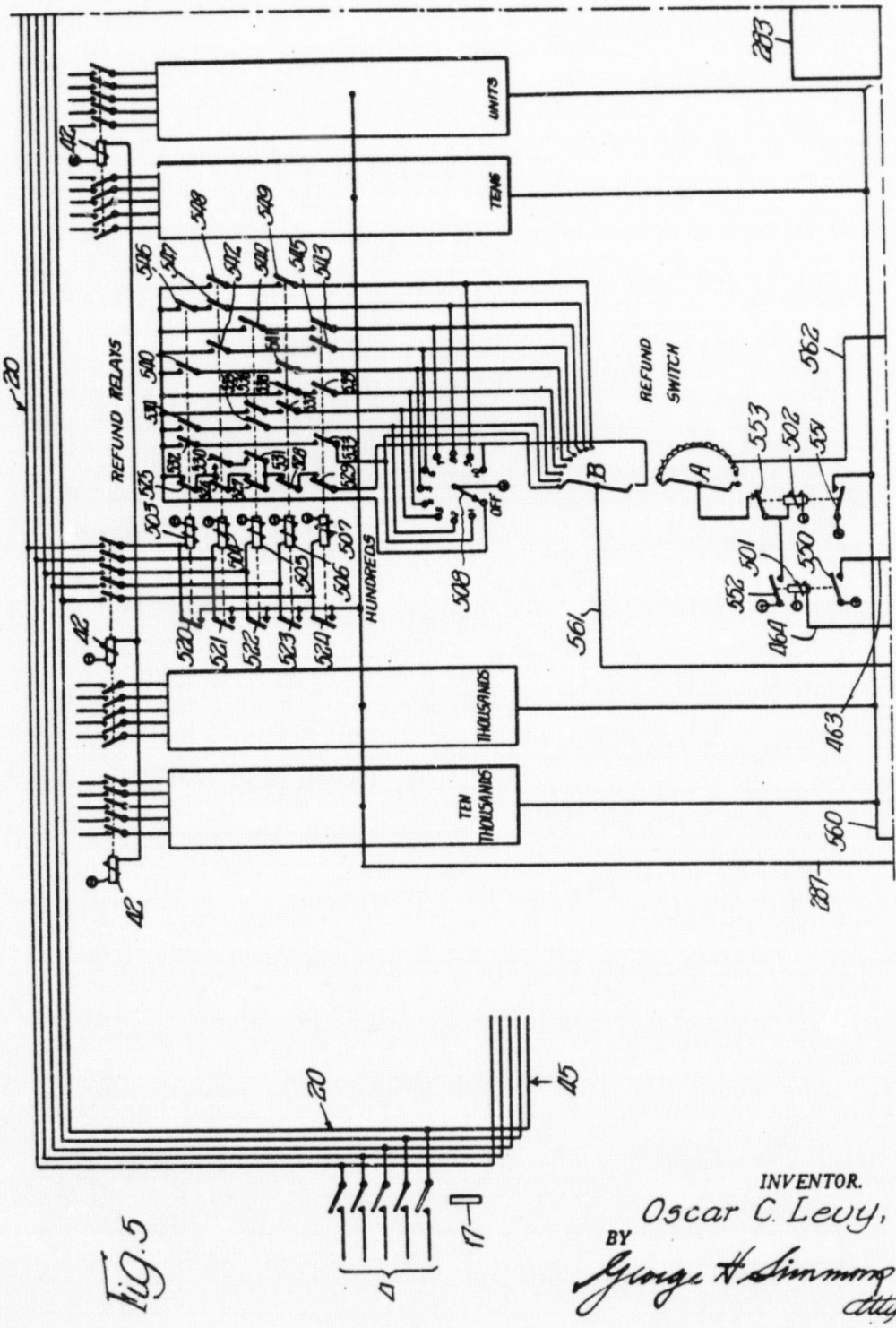


Fig. 5

INVENTOR.
Oscar C. Levy,
BY
George H. Simmons
Atty.

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 6

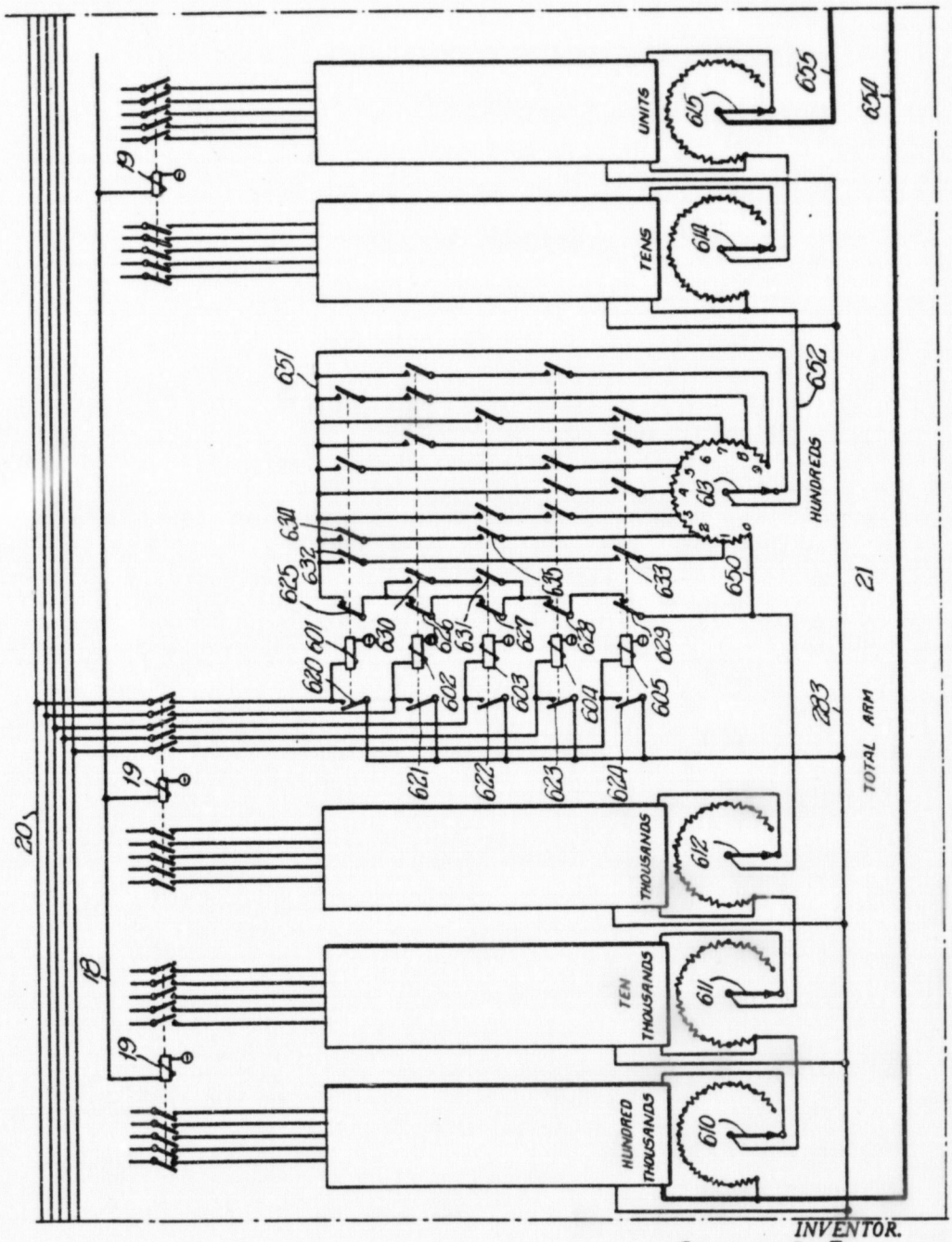


Fig 6

INVENTOR.
Oscar C Levy,
BY George H Simmons
Atty

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 7

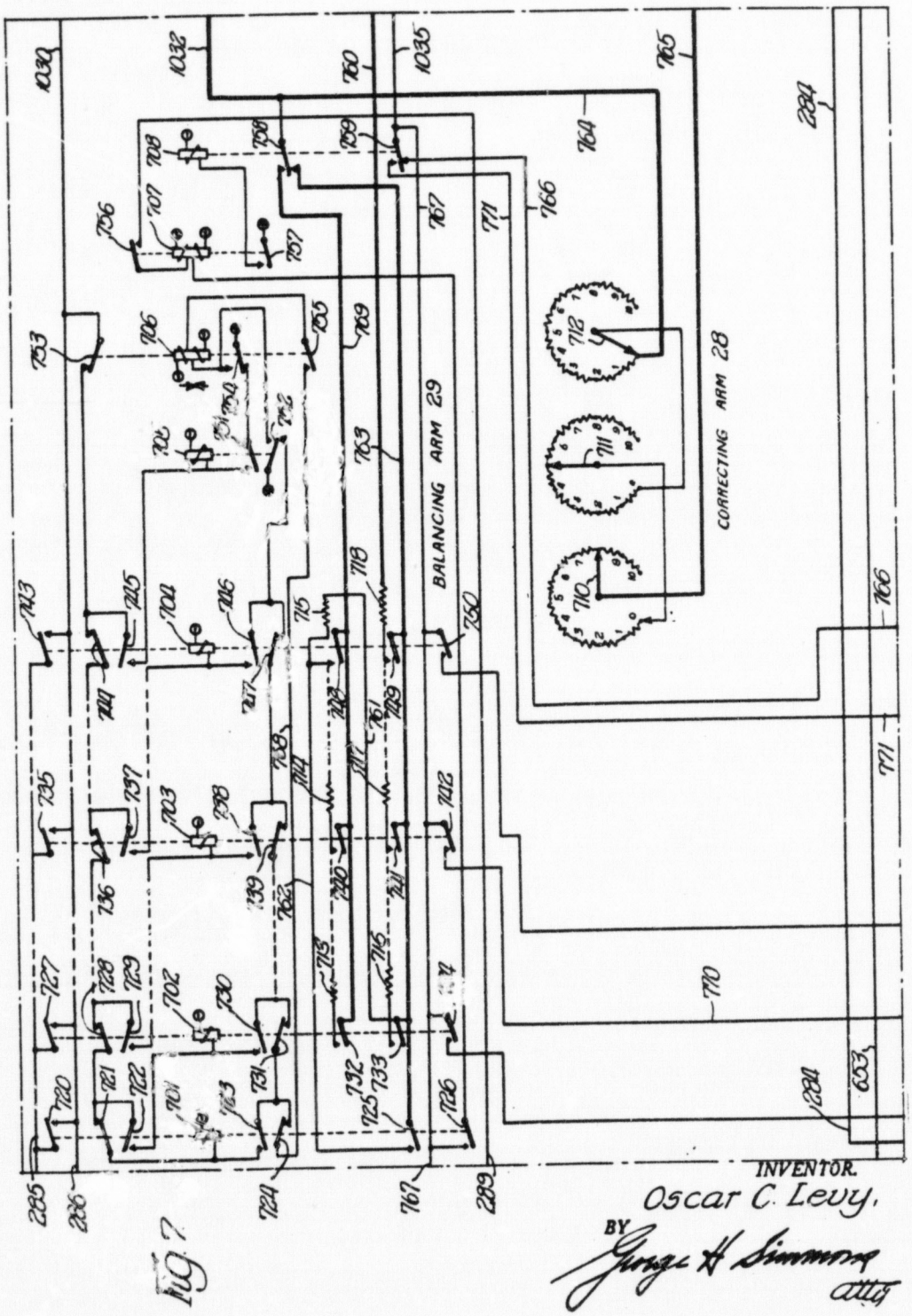


Fig. 7

INVENTOR.
Oscar C. Levy,
BY George H. Simmons
Atty

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 8

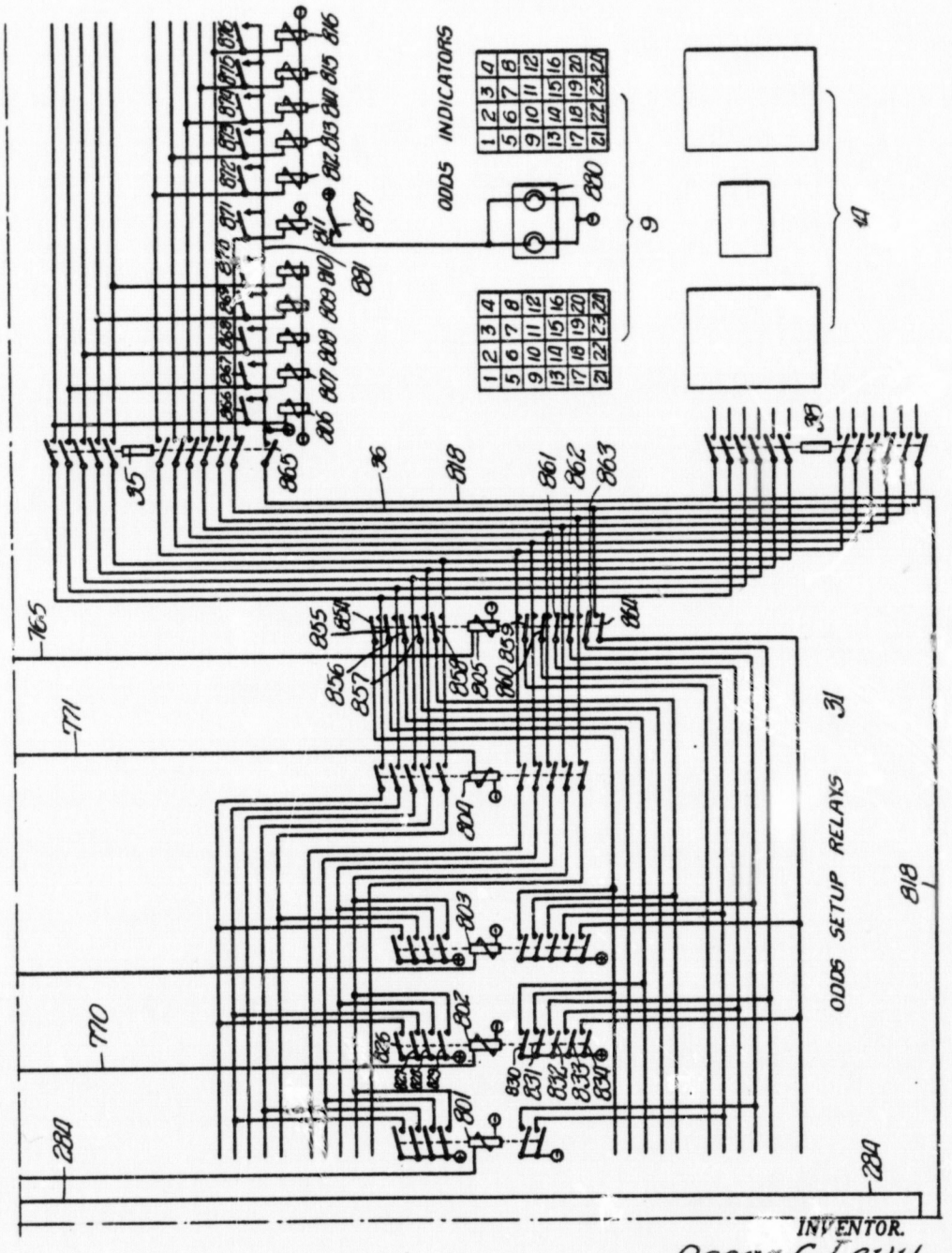


Fig. 8

INVENTOR.
Oscar C Levy,
BY George H. Simmons
Atty

A598

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21, 1949 10 Sheets-Sheet 9

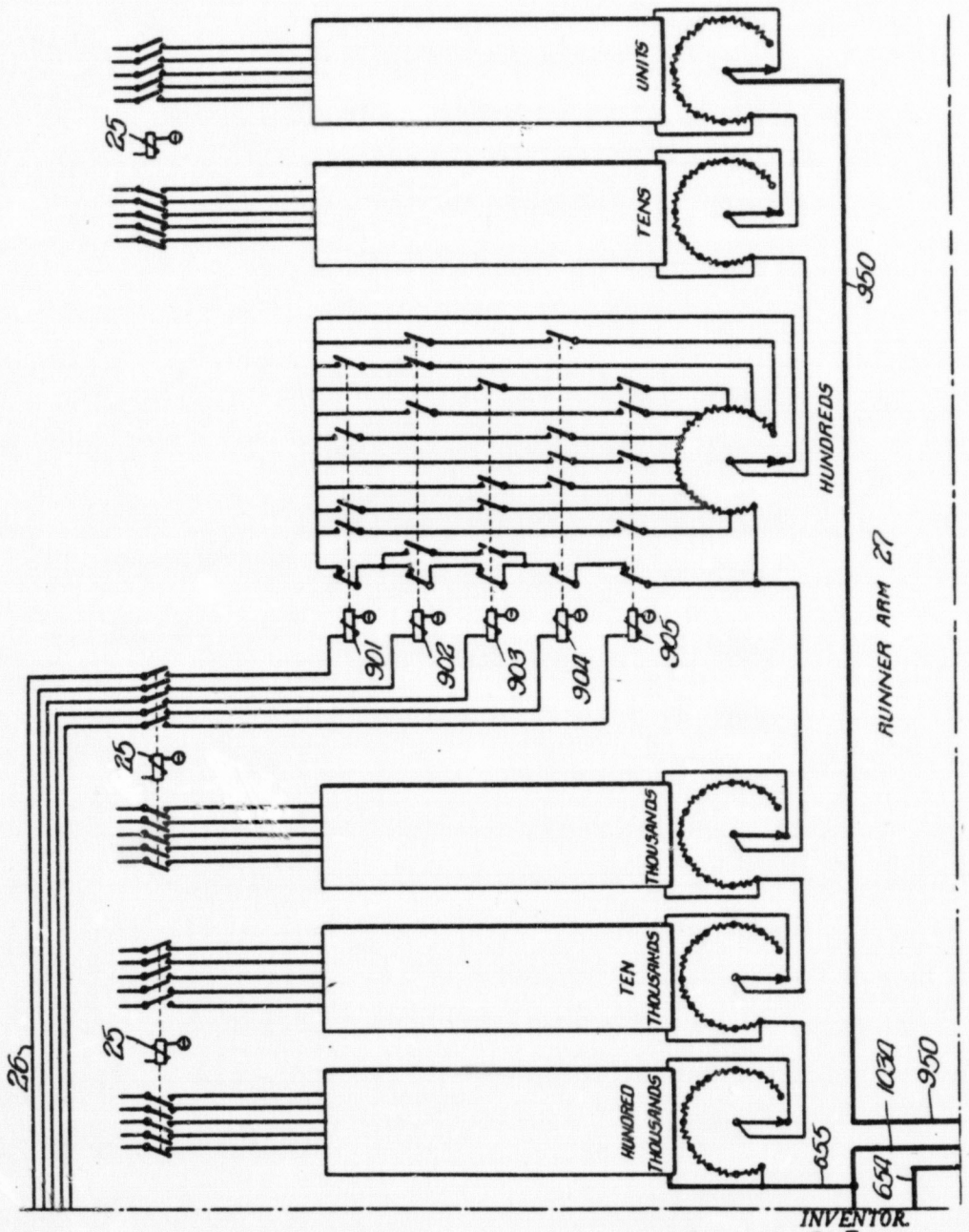


Fig. 9

INVENTOR.
Oscar C. Levy,
BY George H. Simmons
Atty

Sept. 22, 1953 O. C. LEVY 2,652,977

COMPUTER

Filed Dec. 21. 1949 10 Sheets-Sheet 10

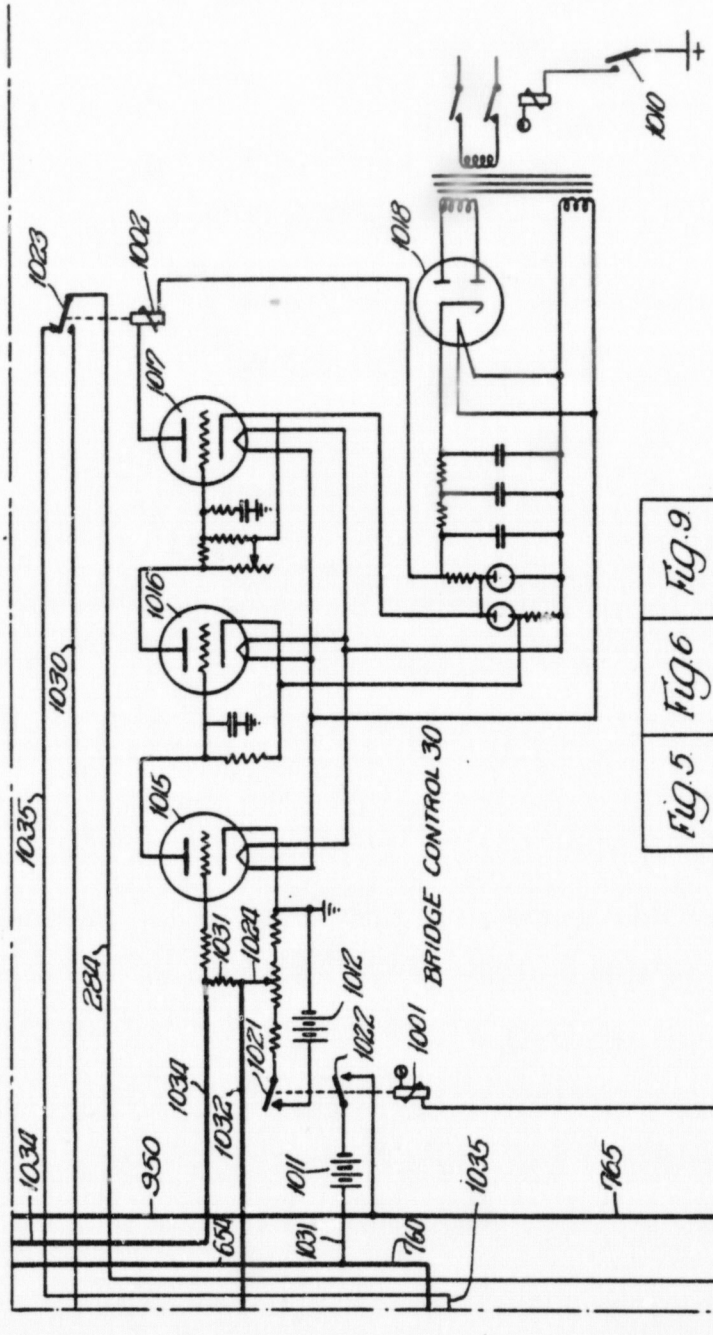


Fig. 11

Fig. 9	Fig 10		
Fig 6	Fig. 7		Fig 8
Fig 5	Fig. 4	Fig. 3	Fig. 2

Fig. 10

INVENTOR.
Oscar C Levy,
BY
George H Simmons
Atty.

Patented Sept. 22, 1953 2,652,977

UNITED STATES PATENT OFFICE

2,652,977

COMPUTER

Oscar C. Levy, Chicago, Ill., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application December 21, 1949, Serial No. 134,313

26 Claims. (Cl. 235—61)

1

This invention relates to automatic computers and has for its principal object the provision of a new and improved device of this kind.

It is a main object of the invention to provide a computer for automatically determining in sequence the ratio existing between each one of a plurality of individual amounts and the sum of said amounts, and for controlling an indicator individual to each amount to indicate the ratio so computed.

Another object of the invention is to provide a computer for automatically determining in sequence the ratio between each one of a plurality of individual amounts and the sum of said amounts minus a fixed percentage of said sum, and for controlling an indicator individual to each amount to indicate the ratio so computed.

Another object of the invention is to provide in a computer for automatically determining in sequence the ratio between each one of a plurality of individual amounts and the sum of said amounts, a device for subtracting one of said individual amounts from said sum and for computing said ratios against the resulting difference minus a fixed percentage of said difference, and for controlling an indicator individual to each amount to indicate the ratio so computed.

Another object of the invention is to provide in a computer, for use in a system in which sums are designated by simultaneously closing a plurality of circuits per digit, a register switch having a plurality of wipers corresponding in number to said circuits, which wipers are stepped over contacts until circuits are completed over all of the wipers simultaneously thereby to stop the switch in a position corresponding to a digit registered in the switch contacts.

Another object of the invention is to provide in a computer a register switch having wipers which are stepped over contacts in search of marked contacts designating a digit registered in said contacts, over which wipers circuits are completed to stop the switch on the marked contacts preparatory to stepping the switch a number of steps corresponding to a subtrahend digit and over which wipers circuits are subsequently extended to transmit out of the switch the digit representing the difference between said first digit and said subtrahend.

Still another object of the invention is to provide a computer for determining and controlling the display of a series of ratios accurately and rapidly.

A further object of the invention is to provide a computer that can be manufactured at low

2

cost and can be maintained in proper working condition economically.

Further objects of the invention, not specifically mentioned here, will be apparent from the detailed descriptions and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example only and in which:

Fig. 1 is a single line diagram of the invention;

Fig. 2 is a schematic of the bridge actuating relays and associated apparatus;

Fig. 3 is a schematic of the late scratch control relays and associated apparatus;

Fig. 4 is a schematic of the register switches;

Fig. 5 is a schematic of the refund relays and refund switches;

Fig. 6 is a schematic of the total arm of the bridge and relays for setting the resistance thereof;

Fig. 7 is a schematic of the balancing and correcting arms of the bridge and of the chain relays by which the balancing arm is controlled;

Fig. 8 is a schematic of the odds indicators and odds setup relays for controlling the same;

Fig. 9 is a schematic of the runner arm of the bridge and relays for setting the resistance thereof;

Fig. 10 is a schematic of the bridge control apparatus; and

Fig. 11 is a diagram showing how Figs. 1 to 10, inclusive, fit together.

As brought out in the co-pending application of Johnston, Serial No. 16,310, filed March 22, 1948, now Patent 2,563,041, issued August 7, 1951, a totalisator accumulates the total value of tickets sold in a particular pool and also the total value of the tickets sold on each runner in that pool. At periodic intervals, usually once every ninety seconds, the adding machines are momentarily connected to indicators and the values thus accumulated in the adding machines are registered on the indicators, which are visible at various points about the premises. Each digit of the values thus displayed is displayed under the control of five relays, two of which must be operated to indicate the digit. After these relays are operated, they are maintained in operated position and maintain positive potential on the busses over which they are operated, after the indication control relays have restored to disconnect the indicators from the adding machines.

The indication busses are also extended to a computing room in the pari-mutuel department,

so as to display the values therein on a suitable indicator, usually a miniature indicator. In the computing room, an odds control man, usually called the odds man, is provided with a set of keys through the manipulation of which he selectively controls the miniature indicator to display first the total sum and then the sums on the individual runners, one at a time.

Teamed with the odds man is an odds calculator who is provided with tables from which he can determine the approximate odds on a particular runner from the sum in the total pool and the sum registered on that runner. The calculator gives the approximate odds to the odds man who then manipulates his keys to select the odds indicator corresponding to that runner and to set that indicator to indicate the approximate odds on that runner.

In States where racing is permitted, the racing statutes provide for withdrawing from the total sums wagered a certain percentage known as the "take." The percentage so withdrawn varies from six to fifteen percent, depending upon the State, and the tables used by the calculator are based upon that part of the total pool available for distribution, that is, the net pool remaining after the "take" has been deducted.

As will be seen in Fig. 1, where the odds computer is shown schematically by a single line diagram, when the odds man operates the proper manual indication selection key, a circuit will be closed from positive over conductor 1 through the winding of relay 2 to negative, operating relay 2 which connects the total bus 3 to the bus 4 thereby to operate the miniature indicator to indicate the total sum then in the total pool. Each digit of such sum being controlled by five relays, busses 3 and 4 contain five wires per digit, and, as shown, the indicator is arranged to handle six digits so that these busses contain thirty wires each.

With the total then in the pool indicated, the calculator selects the proper table and the odds man reoperates the manual selection keys to open the circuit to relay 2 and to extend a circuit from positive over conductor 5 through relay 6 to negative, operating relay 6 which connects the first runner bus 7 to the bus 4 and miniature indicator. The indicator is thus set to indicate the sum registered on runner number one, and by reference to his tables the calculator determines the approximate odds existing on that runner. The calculator informs the odds man of these approximate odds and the odds man manipulates the odds control keys 8 first to close a circuit from positive through relay 35 to negative, thereby to connect the odds indicator 9 corresponding to runner number one to the odds setup control bus 36; and further manipulates the control keys to set the indicator to the approximate odds thus determined. Since the odds indicators, like the other indicators, are controlled by five relays per digit, bus 36 contains eleven wires, five for each of two digits that the indicator is capable of displaying, and one for a dash inserted between these digits to indicate fractional odds, as will presently appear.

The odds on runner number one thus being determined and indicated, the odds man manipulates the selection keys to open the circuit of relay 6 and to close the circuit to the relay, not shown, corresponding to runner number two, the foregoing process being thus repeated for each runner until a circuit is closed over conductor 10 to energize relay 11 and thereby connect the bus 12 corresponding to the twelfth or last runner to the miniature indicator, and the control keys 8 manipulated to energize relay 38, thereby to connect the odds indicator 14 corresponding to the last runner to the odds control bus 36.

The foregoing operations being completed, the odds indications remain until the next indication cycle of the totalisator. In practice, as soon as the line of odds has been completed, the odds man will re-operate the selection keys to close the circuit to relay 2, thereby connecting the total bus to the miniature indicator, so that he and the calculator will be informed of the new total in the pool as soon as it is taken from the adding machine.

The foregoing manual operations are time-consuming. A fast odds man, teamed with a fast calculator, ordinarily can determine a line of odds on twelve runners in approximately one minute; and since in most instances the indication cycle of the totalisator is ninety seconds, the complete line of odds is displayed but briefly before a new indication cycle begins.

The present invention provides for computing odds automatically instead of manually, and for automatically displaying the odds so determined. With a full line of twelve runners, the computer of the present invention will determine and display the approximate odds in approximately five seconds, so that those odds will be displayed during a major portion of an indication cycle rather than during a minor portion, as is the case with manual operation.

In the device of the present invention, one arm of a Wheatstone bridge is automatically set to an ohmic resistance corresponding to the total sum in the pool; a second arm of the bridge is set to an ohmic value corresponding to the sum registered on a particular runner; a third arm of the bridge is set to an ohmic value corresponding to the percentage of the total sum available for distribution after the take has been deducted; and the fourth or balancing arm automatically adjusted step-by-step to bring the bridge into balance. The odds determined by the point at which the bridge is brought into balance are set automatically on the indicators, whereupon the sum on the first runner registered in the second arm of the bridge is removed and the sum corresponding to the second runner substituted therefor and the bridge re-balanced to determine the odds on the second runner, this process being repeated until the odds on all of the runners have been determined and indicated. As soon as the line of odds has been completed, the total arm, the individual arm, and the balancing arm of the bridge and the controls are returned to normal in readiness for re-operation at the beginning of the next indication cycle.

In American practice, winners are entitled to a return of the money paid for the winning tickets plus the odds on those tickets. Thus, for example, the odds on a winning ticket are two to one, each two-dollar ticket paying six dollars, that is, the two-dollar purchase price plus two to one odds or four dollars. The automatic computer takes this into account, indicating the odds only. Thus when odds of two to one are to be indicated, the bridge balances when the amount in the total pool remaining after the "take" has been deducted is three times the amount registered on the runner. In all instances, the odds indicated are the true ratio of the sums, at the balance point of the bridge, minus one.

At the start of the sale of tickets on a par-

ticular race, odds are ordinarily not indicated until the sales total a sum large enough to render display of the approximate odds advisable. In the case of the automatic computer of the present invention, when the total sum reaches this starting value, an automatic operation switch is manually closed to connect the bridge actuating relays to the timer by which the indication cycle of the totalisator is controlled. At the next indication cycle, the timer momentarily closes a circuit to positive, whereupon the bridge actuating relays function to move an access switch comprising wipers 22 and 32 from normal into engagement with the first contact in the banks engaged by those wipers. A circuit is also closed over conductor 13 through the winding of relays 23 to negative, operating relays 23 which remove positive from the manual indication selection keys and also from the manual odds control keys, thereby to render those keys ineffective.

As shown in Fig. 1, there are two relays 23, one associated with the selection keys and the other associated with the control keys, and these relays are operated simultaneously and are in effect one relay. In practice, one or more relays may be used as desired.

As soon as the timer removes positive from the bridge actuating relays, a circuit is closed by these relays from positive over conductor 15 through the winding of relay 2, thereby connecting the total bus 3 to the bus 4. A circuit is also completed from positive over conductor 16 through the winding of relay 17, operating that relay which extends the bus 4 to the computer bus 20; and a circuit is completed from positive over conductor 18 through the relay 19 to operate that relay and extend the computer bus 20 to the total arm 21 of the bridge, that arm thus being set to a value corresponding in ohms to the sum in the total.

The circuits of relays 2 and 19 are then opened and other circuits closed from positive through wiper 22 and the relay 6 to negative, thereby to operate that relay to connect the bus 7 to the busses 4 and 20, and a circuit is completed from positive over conductor 24 through relay 25 to negative, to operate that relay to extend the extension 26 of the bus 20 into the runner arm 27 of the bridge. The runner arm is thus set to an ohmic value corresponding to the sum then registered on the runner number one.

The third or correcting arm 28 of the bridge, located opposite the total arm, is manually set to an ohmic value corresponding to the percentage of the total sum remaining after the take has been deducted. This arm is set to a desired ohmic value prior to the initiation of a computing cycle and being once set remains fixed so long as the computer is used at locations where the take is the same.

The fourth or balancing arm 29 of the bridge contains a total ohmic value proportional to the ohmic value of the correcting arm 28, the resistance of the balancing arm being varied step-by-step until the bridge is brought into balance, at which time the bridge control 30 functions through the balance arm to control the odds setup relays 31.

Simultaneously with the closing of a circuit over wiper 22, a circuit is closed over wiper 32 and conductor 34 through the windng of relay 35 to negative, operating that relay to connect the odds indicator 9, corresponding to runner number one, to the odds control bus 36, so that when the bridge is balanced and the odds setup 31 operated, indicator 9 will be set to indicate the approximate odds thus determined.

The odds on runner number one having thus been determined, the access switch is operated to step wipers 22 and 32 from their first to their second bank contacts, the circuit of relay 6 is opened to disconnect bus 7 from the computer bus 20, thereby to wipe out the setting of the runner arm 27. A circuit closed through wiper 22 and its second bank contact to a relay, not shown, operates that relay to connect the bus corresponding to the second runner to the bus 4, thereby to set the runner arm 27 to an ohmic value corresponding to the sum on runner number two. A corresponding circuit is extended through wiper 32 to connect the odds indicator corresponding to runner number two to the bus 36, and the bridge is re-balanced to determine the odds on that runner.

The foregoing operations are repeated step-by-step until odds have been determined on all of the runners in the race, at which time the access switch returns to normal and relays 23 are de-energized to return the control of the indicators to the manual keys. The odds man and calculator may then check the odds computed by the automatic apparatus, and should occasion arise alter the odds as required. Restoration of the access switch to normal also disconnects the computer bus from the bus 4 and restores all of the bridge arms, except the correcting arm, to normal. When the next indication cycle is initiated, the foregoing operations are repeated.

It sometimes happens that after a number of tickets have been sold upon a particular runner, that runner will be scratched and, according to the rules of the track, purchasers of tickets on a late scratch are entitled to a refund. Obviously odds computed upon a total which includes a sum to be refunded will not be accurate, and in case of a late scratch the operation of the automatic computer is modified as follows:

Late scratch control relays are brought into play to exercise control over the bridge actuating relays, so that when a new indication cycle is initiated relay 2 is not immediately operated to connect the total bus 3 to the bus 4, but rather the relay, such as 6 or 11, corresponding to the scratched runner, is operated to connect the bus corresponding to that runner to the bus 4. Relay 17 is operated as before, and a circuit is closed from positive over conductor 41 through relay 42 to negative to operate that relay and extend the bus 20 into refund relays where the sum registered on the scratched runner is stored. The relay corresponding to this runner and relay 42 are then restored, relay 2 is operated, and a circuit extended from positive over conductor 43 through relay 44 to negative, operating relay 44 to extend the extension 45 of the bus 20 into a subtracting device, wherein the total then existing in the pool is registered. The subtracting device is then operated under the control of the refund relays and the sum stored in those relays subtracted from the total then in the pool. The corrected total thus being determined, the circuit of relay 17 is opened, the circuit of relay 19 closed, relay 44 is maintained operated, and the corrected total placed in the total arm 21 of the bridge. Relays 2, 19, and 44 are then de-energized, and relays 6, 17 and 25 are energized, and the sum then on runner number one is registered in the runner arm and the odds computed against the corrected total as before.

After all of the odds on the runners then re-

maining in the race have been computed and indicated, the access switch returns to normal and upon the next indication cycle relay 2 is immediately operated, together with relays 17 and 44, to register the total sum in the subtracting device and the refund sum stored in the refund relays is subtracted from this total and from each succeeding total until the sale of tickets on that race is closed.

Approximate odds indications, in accordance with standard American practice, are numerous, varying from 99 to 1, down to fractional odds, and in most instances more than fifty different odds can be computed and indicated. I have found that it is convenient to set the total and individual runner arms of the bridge to ohmic values corresponding to one ohm per dollar of value in the sums. Other resistance values will work equally well. I have also found it convenient to place a maximum of 1,000 ohms in the correcting arm of the bridge when zero "take" is encountered. This arm of the bridge is set to a lesser ohmic value, depending upon the "take." Thus, for example, if the "take" is 6%, the correcting arm is set to 940 ohms; if the "take" is 10%, to 900 ohms; and if the "take" is 15%, to 850 ohms, each lesser ohmic value bearing a percentage relation to one thousand ohms the same as the amount available for distribution bears to the gross sum.

The maximum resistance in the balancing arm is arranged to be directly proportional to the maximum ohmic value of the correcting arm. Thus, if the correcting arm has a maximum value of 1,000 ohms, and the highest odds that the computer is capable of computing is 100 to 1, the balancing arm will have a maximum of 100,000 ohms. The balancing arm is preferably controlled by a so-called runaway relay chain, such as, for example, the chain shown in Patent No. 2,179,698 issued to Levy and Johnston, November 14, 1939; and upon operation, each relay in the chain reduces the resistance of the balancing arm until the bridge is brought into balance. While 1,000 and 100,000 ohmic values are convenient for use in the correcting and balancing arms respectively, other values may equally well be used within the teachings of the invention.

Since the adjustment of the correcting arm to correspond to that portion of the pool remaining after the "take" has been deducted, gross totals, as indicated by the adding machines of the totalisator, can be inserted directly into the total arm of the bridge and the odds indicated when the bridge is brought into balance are correct and are the same as if the "take" had been computed and deducted from the total sum before that sum is inserted in the total arm of the bridge. This arrangement permits faster computation of the approximate odds through the elimination of the steps of computing and deducting the take from the total on each cycle.

When the amount accumulated in the pool is sufficient to warrant indicating a line of odds, the computer is brought into operation and remains in operation throughout the remainder of the period during which tickets are sold in that particular pool. The operation is as follows:

Starting the computer in automatic operation

Referring now to Figs. 2 to 10, inclusive, which when fitted together in the manner shown in Fig. 11 show by customary schematic diagram sufficient details of the computer to enable one skilled in the art to understand the scope of the present invention.

Key 1010, Fig. 10, is closed to connect the source of commercial current to the amplifier equipment of the bridge control. In practice, this key is closed at the beginning of the day's operations and remains closed throughout the day so that the amplifier and rectifier equipment will be warm and ready when needed.

Manual key 318, Fig. 3, is the automatic operation switch shown in Fig. 1, and is closed when automatic operation of the computer is to be initiated. Manual keys 315, 316 and 317 and key 221, Fig. 2, are likewise closed at this time.

A circuit may now be traced from positive, spring 247 and its break contact, conductor 350, spring 339 and its break contact, key spring 316 and its make contact, conductor 15, through the winding of relay 2 (Fig. 3) to negative, operating relay 2 which connects the total indication bus 3 to the bus 4, as indicated in Fig. 1. A circuit may also be traced from positive through spring 332 and its break contact, spring 333 and its break contact, key spring 315 and its make contact, through the winding of relay 17 to negative, operating relay 17 which extends the indication bus 4 to the computer bus 20, as indicated in Fig. 1. The bus 20 at the moment is not connected to anything and no circuits are completed over it as yet.

At the next indication cycle, the totalisator timing device 351 (Fig. 3) will momentarily close a circuit which may be traced from positive at the timer, key spring 318 and its make contact, through spring 321 and its break contact, conductor 352, through the winding of relay 206 to negative, operating relay 206. A circuit may now be traced from positive on spring 206A, of relay 206, and its make contact, conductor 353, through the winding of relay 23, to negative, operating relay 23 to disconnect the manual controls effected by the odds man's keys.

Upon operating, relay 206 also closes a circuit from positive through spring 242 and its make contact, through the winding of slow-to-release relay 207 to negative, and relay 207 is operated over this circuit. Relay 207, at spring 243 and its make contact, closes a circuit from positive through slow-to-release relay 208 to negative, operating relay 208. Relay 208 closes spring 246 against its make contact, thereby closing a circuit extending from positive through spring 254 and its break contact, conductor 280, through the twentieth bank contact engaged by the B-wiper of the access switch, through the break contact of and spring 259, through the motor magnet 212 of the access switch to negative, operating the motor magnet which pulls up and opens the circuit just traced by moving spring 259 away from its break contact, thereby advancing the wipers of the switch one step from their twentieth to their first bank contacts. The access switch is the well known rotary type switch, having a plurality of wipers simultaneously stepped over their respective banks of contacts as the motor magnet de-energizes.

It will be noted that the first twelve contacts in the bank engaged by the wiper A of the access switch are connected to positive so that when the access switch steps into engagement with its first bank contacts, positive will be placed on locking conductor 283, which is connected to wiper A. At spring 347 and its make contact, relay 23 locks to conductor 283, so that once operated relay 23

remains operated until the access switch returns to normal, as will hereinafter appear.

Placing the total in the total arm 21 of the bridge

After a short interval of time, the timer 351 opens its contacts thereby breaking the above traced circuit of relay 206 and that relay restores. A circuit may now be traced from positive through spring 242 and its break contact, spring 244 and its make contact, conductor 281, spring 322 and its break contact, key spring 317 and its make contact, conductor 18, through the winding of relay 19 to negative, operating relay 19. As will be seen in Fig. 1, relay 19 extends the computer bus 20 into the total arm 21 of the bridge. As will be seen in Fig. 6, the total arm of the bridge consists of a plurality of resistors that are connected together in series, there being a set of resistors for each digit of the totals to be placed in the bridge arm. Assuming that the resistance of the bridge is to be adjusted to one ohm per dollar value in the total, the units resistors engaged by manual arm 615 will consist of one ohm each, the tens digit resistors engaged by manual arm 614 will have a resistance of ten ohms each, the hundreds digit resistors engaged by manual arm 613 will have one hundred ohms each, the thousands digit resistors engaged by manual arm 612 will have one thousand ohms each, the ten-thousands digit resistors engaged by manual arm 611 will have ten thousand ohms each, and the one-hundred-thousands digit resistors engaged by manual arm 610 will have one hundred thousand ohms each; and further, each of these groups of resistors contains nine units. In Fig. 6, the relay arrangement for setting the resistance value has been fully illustrated in connection with the hundreds digit resistors, this relay arrangement being duplicated for each of the other digits. However, to avoid an unnecessary complication of the drawings, the relays for the other digits have been illustrated merely by a rectangle and it will be understood that that rectangle duplicates the relay arrangement shown.

Energization of relay 19, which as shown in Fig. 6 is three separate relays operating in parallel, extends each of the five wires of each digit section of bus 20 to the relay group controlling the corresponding digit resistors. If desired, relay 19 could consist of a single relay carrying the number of main springs and make contacts required to extend all of the digit sections of the bus to the relay groups. However, I prefer to use standard relays, each of which handles but two digits, as shown, and to connect such relays in parallel so that they function the same as a single relay.

In Figs. 5 and 6, only the hundreds digit section of the busses 4 and 20 is shown, and since the other sections of these busses duplicate this section a clear understanding of the arrangement may be had from what is shown. Relay 2 being operated as explained above, the bus 4 will be connected to the total indicator relays, and two of the five conductors in the hundreds section of the bus will carry positive potential. Relay 17 being operated as explained above, bus 4 will be connected to the computer bus 20 and the energization of relay 19 connects the total indicator relays to the total arm 21 of the bridge.

Assume for the moment that the sum in the total is such that the first (top) and fifth (bottom) conductors of the bus 20 carry positive potential, relay 19 extends the hundreds section of the bus 20 to relays 601 to 605, inclusive, and relays 601 and 605 will be operated over the obvious circuits.

A circuit may now be traced from terminal 650, through the first resistor, through springs 633 and 632 and their respective make contacts, conductor 651, manual arm 613 in its normal position, and conductor 652, to the tens digit resistor group.

Assume now that conductors 1 and 3 of the hundreds digit section of the bus 20 contain positive potential, relays 601 and 603 will be operated to close springs 634 and 635, and a circuit will be extended from contact 650 through the first and second resistance units in series and through the springs 634 and 635 and their respective make contacts to the conductor 651.

If the third and fourth conductors in the hundreds digit section of the bus contain positive potential, relays 603 and 604 will be operated and three sections of the resistance unit will be included in the circuit. If conductors 4 and 5 of the bus contain positive potential, relays 604 and 605 will be operated and four sections of the resistor unit will be included in the circuit. If conductors 1 and 4 contain positive, relays 601 and 604 will be operated, and by closing their respective springs against their make contacts, five sections of the resistance unit will be included in the circuit. When relays 602 and 605 are similarly operated, six units will be included in the circuit. When relays 603 and 605 are operated, seven units will be included in the circuit. When relays 601 and 602 are operated, eight resistance units will be included in the circuit, and relays 602 and 604 will include nine units in the circuit.

In case the hundreds digit of the total equals zero, the second and third conductors of the hundreds section of the bus will contain positive and relays 602 and 603 will operate, and no resistance units will be included, the circuit from contact 650 then extending through spring 629 and its break contact, spring 628 and its break contact, spring 631 and its make contact, spring 630 and its make contact, spring 625 and its break contact, conductor 651, and thence to the tens digit resistor as before. In the event that the sum to be registered does not total $100.00, none of the conductors in the hundreds digit section of the bus 20 will contain positive and the circuit from contacts 650 will be extended through the respective break contacts of springs 625, 626, 627, 628 and 629. Such a condition is not likely to occur in the hundreds digit but may frequently occur in the hundred-thousands and ten-thousands digits.

Whenever any one of the relays 601 to 605, inclusive, is operated, a locking circuit is closed from negative through the respective windings of the relays, a corresponding spring in the group 620 to 624, inclusive, conductor 283 through the A wiper of the access switch, now engaged with its first bank contact, to positive, holding the operated ones of relays 601 to 605, inclusive, in operated position until the access switch returns to normal.

Disconnecting total arm 21 from computer bus

Relay 206, upon restoring, also opens the previously traced circuit for slow-to-release relay 207, which does not immediately release or restore but rather remains in operated position long enough to permit energization of the relays 601 to 605 and similar relays by which the resistance of the total arm of the bridge is ad-

justed. At the end of this interval, relay 207 restores, opening the circuit to relay 19, previously traced, through spring 244 and its make contact, thereby permitting that relay to restore to disconnect the total arm of the bridge from the computer bus 20.

Disconnecting total bus 3 from bus 4

Restoration of relay 207 closes a circuit which may be traced from positive through spring 243 and its break contact, spring 245 and its make contact, through the winding of relay 209 to negative, operating relay 209. Relay 209, by closing spring 248 against its make contact, locks itself to the positive potential maintained on conductor 283, through wiper A of the access switch. Upon operating, relay 209 moves spring 247 away from its break contact, thereby opening the previously traced circuit for relay 2, permitting that relay to restore to disconnect the total bus 3 from the bus 4.

Connecting runner indicator to runner arm 27 of bridge

Operation of relay 209 closes a circuit which may be traced from positive through spring 260 and its break contact, the first bank contact engaged by wiper C of the access switch, spring 258 and its break contact, spring 250 and its make contact, and thence over parallel paths, the one leading through spring 251 and its make contact, through the D wiper of the access switch and its first bank contact, conductor 16, through the winding of relay 6 to negative, operating relay 6 which, as will be seen in Fig. 1, connects the first runner indicator bus 7 to the bus 4. The second of the parallel branches from spring 250 and its make contact extends through the winding of relay 205 to negative, operating relay 205.

A circuit may now be traced from positive through spring 239 of relay 205 and its make contact, key spring 221 and its make contact, conductor 24, through the winding of relay 25 to negative, operating relay 25, which, as will be seen in Figs. 1 and 9, connects the runner arm of the bridge to the extension 26 of the computer bus 20. Relay 25, like relay 19, preferably consists of three relays, each of which handles two digit sections of the bus. The first runner indicator bus 7 now being connected to the runner arm 27 on the bridge, and two of the relays in group 901 to 905, inclusive, will be operated, thereby to adjust the resistance of that bridge arm to a value representing one ohm per dollar value. In Fig. 9, as in Fig. 6, only the hundreds digits section of the bus is shown, the units, tens, thousands, ten-thousands, and hundred-thousands sections being diagrammatically illustrated; and it will be understood that when relays 25 are operated, two of the relays in each of the digits group will be operated simultaneously with the group 901 to 905, inclusive, thereby to set the total resistance in the arm to a value equal to the dollar value then registered on the first runner. The relays in this group remain in operated position only so long as relay 25 is operated and positive potential is maintained on the bus.

Restoring odds indication on runner Number 1

Operation of relay 205 also closes a circuit which may be traced from positive through spring 240 and its make contact, through the E wiper of the access switch and its first bank contact, conductor 34, through relay 35 to negative, operating relay 35 which, as will be seen in Figs. 1 and 8, connects the odds indicator setup bus 36 to the first runner odds indicator 9. Operation of relay 205 also closes a circuit which may be traced from positive through spring 234 of relay 203 and its break contact, spring 252 of relay 209 and its make contact, spring 238 and its make contact, through the winding of relay 204 to negative, operating relay 204. Relay 204, upon operating, moves spring 237 away from its break contact, thereby removing positive potential from conductor 818 to release the operated ones of relays 806 to 816, inclusive, thereby to wipe out the previous odds indication, as will presently appear.

Setting the correcting arm of the bridge

The third or correcting arm 28 of the bridge is shown to comprise three variable resistors engaged by manually controlled contactors 710, 711, and 712 (Fig. 7). As shown in the drawing, this arm is adjusted to 850 ohms, indicating that the track deducts 15% of the pool. This value is set prior to the initiation of automatic operation and when once set remains fixed so long as the take of the track remains the same.

The balancing arm 29 of the bridge

The fourth arm 29 of the bridge comprises a plurality of resistors of which a part are shown at 713 to 718, inclusive, in Fig. 7. This plurality of resistors are connected in series and by-passed, one at a time, under the control of relays 701 to 706, inclusive, to vary the resistance value of the bridge arm. Normally the balancing arm of the bridge is open-circuited and is closed at the beginning of a balancing cycle, as will presently appear.

Energizing the bridge

The conductors which interconnect the four arms of the bridge are shown in heavy lines in Figs. 6, 7, 9 and 10. One end of the total arm 21 is connected through conductor 655 to one end of the individual runner arm 27 and the other end of this latter arm is connected by conductors 950 and 765 to one end of the correcting arm. The other end of the correcting arm is connected by conductor 764 to one end of the balancing arm, and the other end of the balancing arm is connected by conductors 760 and 654 to the other end of the total arm.

When wiper A of the access switch moved into engagement with the first contact in its bank to place positive on conductor 283, as explained hereinbefore, a circuit was completed from that positive over conductor 653 through the winding of relay 1001 to negative. Relay 1001 operates over this circuit and closes spring 1022 against its make contact. A circuit may now be traced from the positive terminal of battery 1011, conductor 1031, conductor 654, through the total arm 21, conductor 655, through the individual runner arm 27, conductor 950, spring 1022 and its make contact to the negative terminal of battery 1011. A parallel circuit extends from conductor 1031, through conductor 760, through the balancing arm 29, conductor 764, through the correcting arm 28, conductor 765, spring 1022 and its make contact to negative of battery 1011, but this circuit is incomplete at the moment since the balancing arm is open-circuited.

The bridge balance testing equipment

Connected to the junction of the correcting and balancing arms of the bridge is a conductor 1032 which is connected through resistor 1031 and conductor 1034 to the junction of the total and

individual runner arms of the bridge. When the bridge is in balance, the potential on the two ends of resistor 1031 will be the same and when the bridge is unbalanced there will be a potential drop across the resistor.

As shown in Fig. 10, a vacuum tube amplifier consisting of tubes 1015, 1016, and 1017 are connected together and to a source of rectified power supplied by tube 1018. A test relay 1002 is connected in the plate circuit of the last one 1017 of the tubes, and the grid of the first one 1015 of the tubes is connected to one end of the resistor 1031. When relay 1001 operates, spring 1021 is closed against its make contact and battery 1012 is thus connected across the grid biasing resistors. By manipulation of potentiometer arm 1024, the basic potential applied to the grid of tube 1015 can be varied, thereby to control the cut-off point of the amplifier. The particular amplifier arrangement shown is by way of example only, as the particular type used is not of the essence of the present invention. So long as the amplifier maintains relay 1002 operated when the bridge is unbalanced and restores the relay when the bridge is in balance or substantially in balance, the requirements of the invention are fully met.

Closing the bridge and making the initial test for range

Operation of relay 204, as hereinbefore explained, also closes a circuit from positive through spring 236 and its make contact, through the winding of relay 201 to negative. Relay 201 having a copper slug on the armature end of its core, as indicated by the cross-hatching at the top of the core, is slow to pull up and does not immediately operate, this delay allowing the relay group controlling the runner arm of the bridge to be operated before relay 201 operates. Relay 201, upon operating, extends the positive just extended through spring 236 and its make contact, through spring 230 and its make contact, conductor 284, to main spring 1023 of test relay 1002 (Fig. 10). The bridge at the moment is incomplete since only three arms of it are now closed; consequently the bridge is out of balance and relay 1002 is in operated position. The positive thereby placed on spring 1023 is extended through the make contact engaged by this spring, conductor 1030, through spring 753 and its break contact, spring 744 and its break contact, thence through corresponding break contacts on intervening relays to spring 736 and its break contact and corresponding contacts on intervening relays to spring 728 and its break contact, through spring 721 and its break contact, through the winding of relay 701 to negative. Relay 701 operates over this circuit and at spring 723 and its make contact establishes a locking circuit for itself which may be traced through springs 731, 739, and 747 and their respective break contacts, through spring 752 and its break contact to positive. Relay 701, by closing spring 725 against its make contact, completes the balancing arm of the bridge. The balancing arm now extends from spring 758 and its break contact, conductor 763, through spring 725 and its make contact, conductor 762, resistor 715, conductor 761, resistors 716, 717, and 718, and the intervening resistors not shown, to conductor 760.

In Fig. 7, the end ones of the test relay chain, relays 702 and 704, are indicated with one intervening relay 703 disposed therebetween. In American practice, a large number of odds are indicated, and in one instance they relay chain in the balancing arm comprises 27 relays, of which relays 701 to 704, inclusive, are a part. Each of the relays 702 to 704, inclusive, will handle two odds values, as will presently appear, so that a total of fifty-two odds indications can be made, depending upon the point at which the bridge is brought into balance.

The operation at this point depends upon whether or not the odds are below ten to one or above ten to one. If they are below ten to one, the bridge will be unbalanced to such an extent that the test circuit will maintain grid potentials through the amplifier, at such values as to maintain the test relay 1002 operated. If the odds are greater than ten to one, the test circuit will adjust the grid potentials so as to block off current flow in the plate circuit leading through test relay 1002 and that relay will fall back to operate the range relay so as to test in the high odds range. Assume for the moment that the odds to be computed from the values now placed in the total and runner arm fall below ten to one.

Balancing the bridge in low odds range

Since the values in the total and runner arms of the bridge are such that the odds are in the low range, test relay 1002 will remain in operated position and the positive previously traced to conductor 1030 will be maintained upon that conductor. The operation of relay 701 therefore closes a circuit from this positive through the previously traced chain of contacts leading to spring 721, thence through spring 722 and its make contact, through the winding of relay 702 to negative, operating that relay which locks itself through spring 730 to the locking chain previously traced to spring 723 of relay 701. At spring 728 relay 702 opens the previously traced circuit to relay 701, and by opening spring 731 from its break contact, opens the locking chain for relay 701, permitting that relay to restore.

At spring 733, which moves into engagement with its make contact when relay 702 operates, that relay removes resistor 715 from the balancing arm of the bridge, thereby altering the potential across the terminals of resistor 1031. Relay 702 thus varies the resistance in the balancing arm of the bridge to test for odds of nine to one when operating in the lower odds range. Assuming that the odds at the moment are less than nine to one, test relay 1002 will remain operated and through spring 729 of relay 702 and its make contact the driving chain will be extended to the next relay in the group, operating that relay which locks itself in the manner of relay 702 which breaks the energizing and locking chain to relay 702 and by-passes the next resistance in the balancing arm, such as, for example, resistance 716. Thus operation continues through the intervening relays until the circuit is extended through relay 703 which operates, and at spring 738 and its make contact locks to the locking chain, and at springs 736 and 739 breaks the operating and locking chains to the preceding relay.

At spring 741, relay 703 by-passes another resistor in the balancing arm, and assuming that the bridge is now in actual balance or near enough to actual balance to cause the potential drop across resistor 1031 to block off the plate current to relay 1002, that relay will restore, and by moving its spring 1023 from its make contact, removes positive from the driving chain conductor 1030, thereby preventing the energization of

the next test relay in the chain. Relay 1002 is a high speed relay and will restore before the next relay in the chain can operate, even though the circuit for that relay is closed the instant relay 703 operates.

Changing the odds indicator

Spring 1023, moving into engagement with its break contact, places positive on conductor 1035, closing a circuit which may be traced through spring 759 and its break contact, conductor 766, through the winding of relay 805 to negative, operating relay 805 which connects the low range odds setup bus to the odds setup bus 36 (Figs. 1 and 8). The positive on conductor 1035 also closes a circuit over conductor 767, through spring 742 of relay 703 and its make contact, conductor 770, through the winding of odds setup relay 802 to negative, energizing relay 802.

A circuit may now be traced from positive through spring 830 of relay 802 and its make contact, the third conductor in the tens digit bus, spring 856 of relay 805 and its make contact, the third conductor in the tens digit section of bus 36, through the make contacts of relay 35, through the winding of relay 808 to negative, operating relay 808.

A second circuit may now be traced from positive through spring 831 of relay 802 and its make contact, through the first conductor in the tens bus, through spring 854 and its make contact, the first conductor in the tens digit section of bus 36, through the make contacts of relay 35, through the winding of relay 806 to negative, operating relay 806.

With relays 806 and 808 operated, circuits are closed to cause the tens digit indicator of indicator 9 to display the number 7. Arrangements for causing these relays to display this digit form no part of the present invention, being more fully disclosed in the above mentioned co-pending application of Johnston.

A circuit may also now be traced from positive through spring 832 and its make contact, through the fifth conductor in the units bus, spring 863 and its make contact, the fifth conductor in the units section of the bus 36, through the make contacts of relay 35, through the winding of relay 816 to negative, operating relay 816.

A circuit may also be traced from positive through spring 833 and its make contact, through the third conductor in the units bus, through spring 861 and its make contact, the third conductor of units section of bus 36, through the make contacts of relay 35, through the winding of relay 814 to negative, operating relay 814. Simultaneous operation of relays 814 and 816 sets the units section of the indicator 9 to indicate the digit 2.

A circuit may now also be traced from positive through spring 834 and its make contact, the dash conductor, spring 869 and its make contact, through the make contacts of relay 35, through the winding of relay 811 to negative, operating relay 811 which closes spring 877 against its make contact, thereby to close the obvious circuit to connect the dash lamps 880 across the source of current, thereby to light these lamps. Indicator 9 therefore now indicates 7 to 2 as the approximate odds on runner number one.

Locking the odds indicator relays

The positive potential previously traced to conductor 767 is extended through the winding of relay 202 to negative. Relay 202 being slow to operate, as indicated by the cross-hatching of the upper end of its core, does not immediately operate, but delays long enough to complete the foregoing operations of setting the odds indicator 9. When relay 202 operates, spring 232 is closed against its make contact, thereby extending a circuit over conductor 818 through armature spring 865 of relay 35, and the main spring now engaged thereby, conductor 881, through spring 866 and its make contact, to lock relay 806 in operated position, and through spring 868 and its make contact to lock relay 808 in operated position, and through spring 874 and its make contact to lock relay 814 in operated position, and through spring 876 and its make contact to lock relay 816 in its operated position, and through spring 871 and its make contact to lock relay 811 in its operated position.

Balancing the bridge in high odds range

If the value on a particular runner is small, so that the approximate odds are greater than 9 to 1 when relay 701 is operated to close the bridge and make the initial test for balance as explained above, the potential across resistor 1031 will be of such value and sign as to cause relay 1002 to restore momentarily, whereupon the positive previously traced over conductor 284 to spring 1023 will be removed from conductor 1030 to momentarily stop the chain and extended to conductor 1035, through conductor 767, through spring 726 and its make contact, through the lower winding of relay 707 to negative, operating relay 707. A circuit may now be traced from positive through spring 235 and its break contact (Fig. 2), conductor 289, through spring 756 and its make contact, through the upper winding of relay 707 to negative, locking relay 707 in its operated position.

At spring 757 and its make contact, relay 707 closes a circuit from positive through the winding of relay 708 to negative, operating that relay. Spring 758 is thereby moved from its break to its make contact, thereby transferring the bridge circuit from conductor 763 to conductor 769 and the bridge arm is thereby open-circuited. The potential across resistor 1031 is thus increased, relay 1002 re-operates and positive is re-applied to conductor 1030, thereby to re-start the chain and the previously traced circuit for relay 702 is established and that relay operated as before.

The balancing arm of the bridge is closed as soon as relay 702 operates, and extends from the junction of conductors 1032 and 764, through spring 758 and its make contact, conductor 769, through spring 732 and its make contact, through resistors 713, 714 and 715 and the intervening resistors, not shown, in series, conductor 761, resistors 716, 717 and 718 and the intervening resistors, not shown, in series, conductor 760, to the junction of conductors 654 and 1031.

As the chain relays operate sequentially, resistors between 713 and 715 are by-passed one at a time as before, and when the bridge is brought into balance relay 1002 will again restore and remove positive from conductor 1030 to stop the chain and apply positive to conductor 1035. Assume for the moment that the chain is in balance when relay 703 is operated. The positive on conductor 1035 will be extended through spring 759 and its make contact, conductor 771, through the winding of relay 804 to negative, operating that relay which connects the spring combinations on the upper ends of relays 801 to 803, inclusive, to the odds setup bus 36. A circuit may also be

to relay 205 and through wiper D to the bus connecting relay such as 6.

Determining odds on next runner

Assuming that runner number two has not been scratched. When wiper C of the access switch engages its second bank contact, it will find positive and the cycle will be initiated again by the energization of relay 205. Wiper D of the access switch will extend a circuit to the relay (not shown) that is connected to its second bank contact. This relay connects the bus 4 to the second runner section of the adding machine, and relays 17 and 25 extend this bus to the runner arm 27 of the bridge, to set in that arm a resistance value indicative of the amount then registered on that runner. Through wiper E, the access switch extends positive through its second bank contact to a relay (not shown) by which the odds indicator for runner number two is connected to the odds setup relays. The bridge is then closed and balanced and the odds indication set up as before. At the completion of the cycle on runner number two, the access switch is re-operated to advance its wipers to the third contacts in the bank and the cycle again repeated.

Scratched runners

As will be seen in Fig. 2, in the example shown, the access switch is capable of connecting the calculator to a maximum of twelve runners. It frequently happens that a smaller number of runners is encountered. Assume for the moment that there is no runner 12. At the beginning of the sale of tickets, the attendant will operate scratch keys such as 222 to 224, for each number that does not have a runner. Since there is no Number 12 runner, key 224 will be operated to move its spring 265 against its make contact. A circuit may now be traced from positive on keyspring 265, through the winding of relay 215 to negative. Relay 215 operates over this circuit moving spring 262 away from its break contact, thereby to remove positive from the twelfth contact in the bank engaged by wiper C of the access switch. The previously traced circuits through wiper C therefore cannot be closed. Spring 262 moves into engagement with its make contact, thereby applying positive to the twelfth contact of the bank engaged by wiper B of the access switch. A circuit may now be traced from positive on the twelfth bank contact, wiper B, spring 259 and its break contact, magnet 212 to negative. Magnet 212 operates over this circuit and by moving spring 259 from its break contact interrupts its own circuit and falls back to advance the wipers from the twelfth to the thirteenth contacts in the banks. Thus the computer is made to skip runner numbers when there are no tickets sold on those numbers.

Restoring the computer

As will be seen in Fig. 2 in the bank engaged by wiper B of the access switch, contacts 13 to 19, inclusive, are connected together and permanently connected to positive. Thus, whenever wiper B moves into engagement with the thirteenth contact, the above circuit for the magnet 212 will be closed through the wiper and interrupted by spring 259, and the access switch will operate automatically until wiper B engages its twentieth bank contact which is not connected to positive.

It will also be noted that the first twelve contacts in the bank engaged by wiper A of the access switch are connected together and to positive. When the switch moves from the twelfth to the thirteenth contact, relay 209, which was locked in operated position through wiper A, will restore, thereby to restore the computer to normal where it remains until the next impulse is received from the indicator cycle timer 351. Removal of positive from wiper A removes positive from conductor 283 and all relays locked to that conductor will restore. The energized relays in the group 601 to 605, inclusive, restore to restore the total arm of the bridge, and relay 23 restores to return the indicators to the control of the odds man's keys.

Late scratch

It may happen that after a number of tickets on a particular runner have been sold, that runner may be scratched. In such case the tickets sold on a scratched runner are redeemable and the value of those tickets may appreciably affect the odds on other runners. In such case, when the late scratch is made, the totalisator is momentarily stopped and the odds computer momentarily stopped, during which interval the sum then registered in the totalisator on the scratched runner is transferred to storage relays and the computer adjusted so as to cause it to correct the total displayed at each successive indication cycle prior to placing that total in the runner arm of the bridge. The operation is as follows:

Setting the computer for late scratch

The indication cycle key 318 is opened to disconnect the indication cycle timer from the control relay. The key corresponding to the late scratch—for the moment assume it to be key 222—will be operated to close the upper set of springs 266, 267 and 268 against their respective make contacts thereby to scratch runner Number 1. A circuit may now be traced from positive through spring 266 and its make contact, through the winding of relay 213 to negative, operating that relay which at spring 260 and its break contact removes positive potential from the first contact in the access switch bank engaged by wiper C and at spring 260 and its make contact applies positive to the first contact in the bank engaged by wiper B thereby to cause the access switch to skip runner Number 1 in future cycles.

At spring 267 and its make contact, positive is applied to conductor 290, thereby to complete the circuit through the winding of relay 301 to negative, relay 301 operating over this circuit. Push button 319 is then closed to extend a circuit from positive through spring 321 and its make contact, through the winding of relay 302 to negative, operating relay 302. A circuit may now be traced from positive through spring 323 and its make contact, through the winding of relay 303 to negative, operating relay 303.

At spring 327 and its make contact, relay 303 closes a circuit from positive through the winding of relay 307 to negative, operating relay 307 which, at spring 335 and its make contact, closes a circuit through relay 308 to negative, operating relay 308.

At spring 320 and its make contact, relay 301 closes a circuit from positive over conductor 287, through spring 346 and its break contact, through the winding of relay 309 to negative, operating relay 309 which at spring 339 and its break contact opens a previously traced circuit for relay 2 which restores to disconnect the total bus 3 from the bus 4.

traced over conductor 767 through spring 742 and its make contact, conductor 770, through the winding of relay 802 to negative, operating that relay which at springs 826 and 827 applies positive to the first and second conductors in the tens section of the odds indicator bus, thereby to operate relays 806 and 807 to set the tens indicator to indicate the digit 4.

At springs 828 and 829, relay 802 applies positive to the third and fourth conductors of the units section of the odds indicator bus, thereby operating relays 814 and 815 to set the units indicator to zero thereby to indicate the odds of 40 to 1 on the runner. The locking and other operations of the odds setup relays and indicators are the same as hereinbefore explained and need not be repeated.

Releasing runner Number 1 from the bridge and connecting Number 2 thereto

Operation of relay 202 also closes a circuit from positive through spring 231 and its make contact, through the winding of relay 211 to negative, operating relay 211 after a brief interval, since relay 211 is slow to operate as indicated by the cross-hatching at the upper end of its core.

Operation of 211 closes a circuit from positive through spring 256 and its make contact, through the winding of magnet 212 of the access switch, operating that magnet preparatory to advancing the wipers of the switch from their first to their second bank contacts.

Operation of relay 211 moves spring 258 away from its break contact, thereby breaking the previously traced circuit for relay 6, permitting that relay to restore, thereby to disconnect the runner number one indicator bus 7 from the bus 4. Spring 258 also opens the previously traced circuit for relay 205 which restores immediately, and by opening spring 240 from its make contact breaks the previously traced circuit for relay 35, permitting that relay to restore.

Restoration of relay 35 transfers the locking circuit on conductor 881 from conductor 818 to positive on the break contact. The spring combination controlled by armature spring 865 being a make-before-break combination, this locking circuit is maintained and the relays in group 806—816, which are operated, are consequently maintained to maintain the odds indication which has been set up.

Restoration of relay 205 opens spring 239 from its make contact, thereby opening the previously traced circuit for relay 25, to disconnect the control relays in the runner arm of the bridge from the extension 26 of bus 20. It will be noted that the relays in group 901—905, inclusive, heretofore operated to set the resistance of the runner arm, contain no locking springs, and consequently upon the restoration of relay 25 the operated ones of relays 901 to 905, inclusive, and of the other relays controlling the other digits in the runner arm, all restore to normal, thereby restoring the resistance of the runner arm to zero.

Operation of relay 211, as above, also closes a circuit which may be traced from positive through spring 257 and its make contact, through the upper winding of relay 203 to negative.

Restoration of relay 205, by opening spring 288 from its make contact, breaks the previously traced circuit for relay 204, permitting that relay to restore. Restoration of relay 204 closes a circuit through spring 236 and its break contact, conductor 285, through spring 735 of relay 703 and its make contact, and thence over parallel paths, the one over conductor 280, through spring 233 of relay 203 and its make contact, through the lower winding of relay 203 to negative, thereby to maintain relay 203 operated until the chain relays are restored to normal. The second parallel branch from spring 735 and its make contact reapplies positive to drive conductor 1033, whereupon the chain circuit will be extended through spring 737 and its make contact to the next relay in the chain, and the chain will run out until relay 704 is operated, at which time, through spring 745 and its make contact, relay 704 will close a circuit through the winding of relay 705 to negative, operating relay 705 which locks itself through spring 751 and its make contact through spring 754 and its break contact to positive. By moving spring 752 from its break contact, relay 705 breaks the previously traced locking circuit, permitting locked relays in the chain to restore. Spring 752, moving into engagement with its make contact, closes a circuit from positive through the lower winding of relay 706 to negative, operating relay 706 which, through spring 754 and its make contact, locks itself to positive through its lower winding. Spring 754, moving from its break contact, opens the locking circuit for relay 705 which restores.

As soon as all the relays in the chain have restored, a circuit may be traced from positive through spring 752 and its break contact, through the break contacts of springs 747, 739, and 731 in the locking chain, through spring 724 and its break contact, conductor 768, through spring 755 and its make contact, through the upper winding of relay 706 to negative. Relay 706 being differentially wound, as indicated by the opposed arrows, restores when both of its windings are energized.

The individual runner arm of the bridge now being at zero resistance, the total arm of the bridge now having the resistance corresponding to the value of the last total registered therein, the balancing arm of the bridge now being open and the correcting arm closed, the bridge will be unbalanced and test relay 1002 will re-operate. Spring 1023 moves out of engagement with its break contact and into engagement with its make contact.

Restoration of relay 204 opens the previously traced circuit for relay 201 and by moving spring 230 away from its make contact removes positive from conductor 284, thereby to remove positive from the spring 1023, and in turn from the driving conductor 1030, so that the chain remains inactive.

Removal of positive from conductor 284 also removes positive from conductor 767 opening the previously traced circuit for relay 202, which restores, and the previously traced circuit for relay 802 which also restores; and also removes positive from conductor 766 to open the circuit of relay 805 which likewise restores.

Restoration of relay 202 opens the previously traced circuit for relay 211, which restores, and at springs 257 opens the circuit through the upper winding of relay 203. If the chain has restored to the point where the circuit through the lower winding of relay 203 has been opened, as by the opening of contacts 743, relay 203 restores. At spring 256, relay 211 opens the circuit of magnet 212 of the access switch, permitting that magnet to restore and advance the wipers of the switch from their first to their second bank contacts. At spring 258 relay 211 prepares the previously traced circuit from wiper C of the access switch

At spring 339 and its make contact, relay 309 closes a circuit from positive placed on conductor 350 by spring 247 and its break contact, through the winding of relay 23 to negative, operating relay 23 to move control of the indicators from manual to automatic.

At spring 338, relay 309 closes a circuit from positive through slow operating relay 310 to negative, causing relay 310 to operate after a brief interval.

At spring 340 relay 310 closes a circuit from positive through spring 344 and its break contact, conductor 360, through the windings of relays 42 to negative, operating relays 42 which connect the computer bus 20 to the refund relay group.

At spring 341 and its make contact, relay 310 closes a circuit from positive, through spring 345 and its break contact, conductor 288, key spring 268 and its make contact, through the winding of relay 6 to negative, operating relay 6 which connects the number one runner bus 7 to the bus 4. Relay 17 being operated over the previously traced circuit from positive through springs 332 and 333 and their respective break contacts, the runner bus 7 will be connected to the refund relays.

Registering refund sum in refund relays

In Fig. 5, the refund relays are shown to consist of five relays per digit, of which only relays 503 to 507, inclusive, are shown, these relays controlling the hundreds digit of the sum. Two of the relays will be operated to register the hundreds digit in the refund relays, and simultaneously two relays in each of the other digit sections of the refund register will be simultaneously operated. Positive previously traced on conductor 287 is extended through the make contacts 520 to 524, inclusive, of the operated relays, thereby to lock those relays in operated position to retain the refund sum in the register.

At spring 343 and its make contact, relay 310 closes a circuit from positive through conductor 354, the twentieth contact of the bank of the access switch engaged by wiper B, through spring 259 and its break contact, through the winding of magnet 212 to negative, operating that magnet which opens spring 259 to advance the access switch to its first bank contacts. Since relay 213 is operated, and positive placed on the first bank contact engaged by wiper B, the above circuit for magnet 212 will again be closed and the switch will take another step, coming to rest on its second bank contact.

At spring 342, relay 310 closes a circuit through the winding of relay 311 to negative, operating that relay. Relay 311 having a copper slug on the armature end of its core, as indicated by the cross-hatched area at the upper end of the core, is slow to pull up and this delay is sufficient to permit registration of the sum to be refunded as explained above.

Disconnecting bus from refund relays

At spring 344, relay 311 opens the previously traced circuit for relays 42, restoring those relays to disconnect the refund relays from the computer bus.

At spring 345, relay 311 opens the previously traced circuit for relay 6, permitting that relay to restore.

At spring 346 and its make contact, relay 311 establishes a locking circuit for itself, which circuit extends to positive on conductor 287 thereby maintaining relay 311 operated so long as relay 301 remains operated.

At spring 346 and its break contact, relay 311 opens the previously traced circuit for relay 309, thereby permitting that relay to restore and by re-closing spring 339 against its break contact closes the previously traced circuit for relay 2, operating that relay to re-connect the total bus 3 to the bus 4.

Operation of relay 308, as explained above, closes a circuit from positive through spring 337 and its make contact, conductor 352, through the winding of relay 206 to negative, operating that relay which closes a circuit for relay 207 as before. Relay 207 closes a circuit for relay 208 to prepare the bridge actuating relays for a computing cycle as before.

Registering the total in the register switch of the subtracting device

The foregoing operation having been completed, the attendant restores push button 319 and closes key 318 to reconnect the bridge actuating relays to indication cycle timer 351. If the timer is at the moment in such position as to maintain positive on the conductor leading through the key, nothing happens until the timer opens the circuit from the conductor to positive. If positive is not present on this conductor, the previously traced circuit of relay 302 is opened and that relay restores.

At spring 323 and its break contact, relay 302 closes a circuit through spring 326 and its make contact, through the winding of relay 304 to negative. Relay 304 operates over this circuit closing spring 329 and its make contact, thereby to extend a circuit from positive through the winding of relay 44 to negative.

As will be seen in Figs. 1, 4 and 5, relay 44 connects the extension 45 of the computer bus 20 to the banks of the register switch engaged by the B and C wipers of that switch.

Relays 2 and 17 now being both operated, relay 44 connects the total bus 3 to the bank contacts and positive on two of the five conductors in each digit section of the bus will thereby be placed upon those contacts.

The bus wires are connected into the banks of the register switch in a reverse order so that to reach a marked contact the switch takes a number of steps equal to the difference between the numerical value of the digit and ten. Thus, for example, if the digit is 7, the switch will step three steps from a starting position before encountering contacts to which potential is applied to indicate the digit 7. Following is a table showing the digit, the bus wires in the digit section to which positive is applied to indicate that digit, and the contacts engaged by wipers B and C to which those bus wires are connected:

Digit	Bus Wires	Bus Conductor	Contacts Bank B	Bus Conductor	Contacts Bank C
9	2 and 4	2	1	4	1
8	4 and 5	4	2	5	2
7	1 and 3	1	3	3	3
6	1 and 4	1	4	4	4
5	2 and 5	2	5	5	5
4	1 and 2	1	6	2	6
3	2 and 3	2	7	3	7
2	3 and 5	3	8	5	8
1	1 and 5	1	9	5	9
0	3 and 4	3	10	4	10

Repeated contacts 11 to 20, inclusive, banks B and C

Setting register switches on total

Restoration of relay 302 also closes a circuit from positive through spring 324 and its break contact, spring 328 and its make contact, relay 303 being slow to release, not yet having restored, conductor 361, through the winding of relay 402 to negative, with a parallel path extending over conductor 468, through the winding of relay 406 to negative. Relays 402 and 406 operate over this circuit, relay 402 closing springs 421 against its make contact, thereby locking the relays to positive placed on conductor 283 by wiper A of the access switch which now engages the second contact in its bank.

Relay 402 opens spring 453 from its break contact thereby removing positive from the bank of the refund switch (Fig. 5) engaged by wiper A of that switch, and opens springs 436, 437, 454 and 457 from their respective break contacts thereby to remove positive from the A banks of the other refund switches.

Relay 406, upon operating, closes a circuit for the motor magnet 416 of the register switch, which circuit may be traced from positive through spring 447 and its break contact, spring 443 and its break contact, over parallel paths through the break contacts of and springs 441 and 442, spring 445 and its make contact, conductor 463, through the winding of magnet 416 to negative.

Magnet 416 operates over this circuit, opening springs 447 to break the circuit, permitting the magnet to fall back and advance the wipers one step. As soon as the magnet falls back, its circuit as above traced is re-established and the magnet again operates, causing the switch to operate in a buzzerlike fashion to move its wiper step-by-step over the bank contacts.

Magnet 416 and the corresponding motor magnet of each of the other digit switches in the subtracting device apply positive to conductor 460, magnet 416, by closing spring 448 against its make contact. Slow-to-release relay 303, upon operating, closes spring 325 against its make contact, thereby extending its circuit from the positive on conductor 460 through the winding of relay 303 to negative, holding that relay in operated position so long as the motor magnets are intermittently operated as above.

Either of the wipers B and C of the register switches may encounter positive on any one of their respective bank contacts dependent upon the digit registered in the switch. Both of the wipers B and C will encounter positive only when engaging contacts corresponding to the digit registered in the switch. Assume for the moment that the digit is 7. From the foregoing code, it will be seen that both wipers will engage positive when engaging the third contact in their respective banks. Circuits will thus be simultaneously extended from that positive through wiper B, spring 445 and its break contact, through the winding of relay 413 to negative and through wiper C, spring 446 and its break contact, through the winding of relay 412 to negative, operating those relays. Springs 441 and 442 thus being opened from their respective break contacts at the same instant, the circuit of motor magnet 416 is broken and the register switch comes to rest on its third bank contacts, indicating that the hundreds digit of the total is the digit 7. Each of the other switches seeks out marked contacts indicative of the digit in the same manner.

Stopping the hundred thousands digit register switch

In Fig. 4, the hundred thousands digit register switch, operated by magnet 411, is partially shown. It will frequently happen that the sum in the total does not equal $100,000.00, in which case wipers B and C of this switch will fail to find positive potential simultaneously, and if provisions for stopping the switch were not made the switch would buzz on continuously, thereby maintaining relay 303 in its operated position and delay further operations. To guard against such contingency, relay 402, upon operating, closes spring 433 against its make contact, thereby applying positive to conductor 467 and to the wiper D of the hundred thousands register switch.

When wiper D engages the nineteenth contact in its bank, a circuit may be traced from that wiper and contact through the winding of relay 403 to negative, operating relay 403 which, by closing spring 430 against its make contact, locks itself to positive on conductor 467.

At spring 429 and its make contact, relay 403 applies positive to the twentieth bank contacts engaged by wipers B and C of the switch, so that upon taking one more step these wipers find positive simultaneously, relays 407 and 408 are operated, and the circuit of motor magnet 411 is open.

It may happen that the sum to be registered in the subtracting switch does not equal $10,000.00 and the ten thousands register switch likewise has to be stopped. Relay 403, by closing spring 428 against its make contact, extends positive over conductor 469 to the twentieth contacts in the banks of the ten thousands register switch engaged by wipers B and C of that switch.

Each of the digit register switches in the subtracting device having thus come to rest, positive is removed from conductor 460 and relay 303 restores.

Subtracting the refund sum from the total sum

Relay 303, upon restoring, closes a circuit from positive through spring 323 and its break contact, spring 326 and its break contact, and thence over parallel paths, one extending through spring 330 and its make contact, through winding of relay 306 to negative, operating relay 306. Relay 306 at spring 333 and its break contact opens the circuit of relay 17 which restores to disconnect the computer bus 20 from the bus 4. At spring 333 and its make contact, relay 306 locks itself to positive through spring 332 and its break contact. The second parallel path extends from spring 326 and its break contact, conductor 461, spring 420 and its make contact, spring 422 and its make contact, through the winding of relay 409 to negative, operating relay 409.

Relay 409 closes a circuit from positive through spring 424 and its make contact, conductor 462, from which branches extend into each of the digit switches; in the hundreds digit, the circuit extending through the winding of relay 414 to negative, operating that relay.

A circuit may now be traced from positive through spring 447 and its break contact, spring 443 and its make contact, spring 444 and its break contact, conductor 464, through the winding of relay 501 to negative, operating relay 501.

Relay 501 closes a circuit from positive through spring 552 and its make contact, through the winding of motor magnet 502 to negative, operating that magnet preparatory to advancing the wipers of the refund switch.

Magnet 502, upon operating, closes a circuit from positive through spring 551, conductor 560, spring 334 and its make contact, through the winding of relay 307 to negative, to maintain that relay operated so long as magnet 502 operates. Conductor 560 is multipled into similar contacts operated by the motor magnets of the other digit switches, and relay 307 will be locked in operated position so long as any one of the switches is operating, the relay being slow to release does not restore between successive energizations of the magnets.

Relay 501 also closes a circuit from positive through spring 550 and its make contact, conductor 463, through the winding of magnet 416 to negative, operating that magnet preparatory to advancing the wipers of the register switch.

At springs 447, magnet 416 opens the circuit of relay 501, causing that relay to restore and open the above circuits of magnets 416 and 502, whereupon the two switches take one step each. Restoration of magnet 416 again closes the circuit for relay 501 and the foregoing operation is repeated, stepping the switches step-by-step until the B wiper of the refund switch encounters the contact upon which positive has been placed to indicate the hundreds digit of the sum to be refunded.

A circuit may now be traced from that positive through wiper B, conductor 561, spring 458 and its make contact, through the winding of relay 415 to negative, operating relay 415 which opens spring 444 from its break contact, thereby opening the circuit of relay 501 to prevent that relay from operating to step the switches another step.

Assume for the moment that the hundreds digit of the total sum is 7, and that the hundreds digit of the subtrahend is 5. The switches therefor would take five steps before being stopped; and since the register switch was resting on its third bank contact when such stepping began, the switch will come to rest on its eighth bank contact. From the above table, it will be seen that the eighth contact corresponds to the digit 2, which is the difference between 7 and 5.

Simultaneously with the foregoing stepping of the hundreds digit switches, the switches of the other digits are stepped so that the register switches are in positions corresponding to the difference which is the corrected total.

Assume for the moment that the register switch wipers were positioned on their respective seventh bank contact, indicating that the hundreds digit of the total was 3 and that the hundreds digit of the subtrahend was 5. It is therefore necessary for the hundreds digit to borrow one from the thousands digit in arriving at the correct difference.

Borrow circuits

Starting from the seventh bank contact, the wipers of the register switch will engage their tenth bank contact at the end of the third one of the five steps to be taken. Energization of relay 409, as above, closes the circuit from positive through spring 423 and its make contact, through the winding of relay 401 to negative, operating that relay, which closes springs 449 connected to the D wiper of the hundreds register switch and closes springs 438, 439, 455 and 458 connected to the D wipers of the other digit switches.

When magnet 416 is again energized preparatory to advancing the switch wipers from their tenth to their eleventh bank contacts, a circuit may be traced from positive on conductor 463 through the first nineteen contacts of the bank engaged by wiper A of the register switch, which contacts are multipled together, conductor 465, the tenth bank contact engaged by wiper D and that wiper, spring 449 and its make contact, conductor 466, to a relay in the thousands digit corresponding to relay 417 in the hundreds digit, to negative, operating that relay.

Assume, also, that the tens digit is borrowing from the hundreds digit so that relay 417 will be operated, the relay locking from positive on conductor 467, through spring 450 and its make contact, and the lower winding of the relay to negative.

The remaining two steps of the five to be taken in the example assumed above having been completed and the switches brought to rest, when relay 307 falls back as it will when motor magnet 502 maintains springs 551 open, thereby removing positive from conductor 560, a circuit may be traced from positive through spring 335 and its break contact, spring 336 and its make contact, conductor 470, through the winding of relay 405 to negative.

Relay 405 operates and in the hundreds digit register closes spring 451 against its make contact thereby extending a circuit from positive through spring 459 and its make contact, conductor 465, the multipled together bank contacts engaged by wiper A of the register switch, through the winding of magnet 416 to negative.

In each of the other digit switches in which a borrow has been made, similar circuits are closed.

Restoration of relay 307 opens the circuit of relay 308 which, after a brief interval, falls back, opening the above traced circuit for relay 405, thereby opening springs 451 permitting magnet 416 to restore and advance the switch wipers one step, thereby reducing the numerical value of the digit by one.

Placing the corrected total in the total arm of the bridge

Restoration of relay 308 opens the previously traced circuit for relay 206 by moving spring 337 away from its make contact, permitting that relay to restore and at spring 242 and its break contact close a circuit from positive through spring 244 and its make contact, conductor 281, spring 322 and its make contact, through the winding of relay 305 to negative, operating relay 305. Spring 332 moves away from its break contact, thereby opening the previously traced locking circuit for relay 306 which restores to prepare a point in the circuit of relay 17. Spring 332 moving into engagement with its make contact closes a circuit from positive through key spring 317 and its make contact, through the winding of relay 19 to negative, operating that relay to connect bus 20 to the total arm of the bridge.

Relay 305, by closing spring 331 against its make contact, re-closes the previously traced circuit of relay 44, thereby connecting the banks of the register switch engaged by wipers B and C to bus 20, and through relay 19 to the relays controlling the setting of the resistance of the total arm of the bridge.

Positive placed on wiper B of the register switch, through spring 445 and its make contact, and on wiper C through spring 446 and its make contact, will close circuits to operate two of the relays in the group 601 to 605, inclusive, thereby to set the hundreds digit section of the bridge arm to a value corresponding to the hundreds digit in the corrected total.

Relay 206, upon restoring, opens the circuit

of relay 207 which, after a brief interval, restores and at spring 243 and its break contact closes a circuit through spring 245 and its make contact, through the winding of relay 209 to negative, operating that relay which, through spring 248 and its make contact, locks to positive picked up by the A wiper of the access switch which, as hereinbefore explained, is now resting on its second bank contact.

Circuits hereinbefore traced are completed through the C and D wipers of the access switch, thereby to connect the bus on runner Number 2 to bus 4, relay 17 is re-operated when relay 306 restores, and a resistance corresponding to the sum then registered on runner Number 2 is placed in the runner arm of the bridge. The operation through the remainder of the cycle is the same as hereinbefore explained.

Restoring the subtracting device

When the access switch moves from its twelfth contact, wiper A moves out of engagement with positive potential thereby removing positive from conductor 283, restoring relays 402 and 406 which were locked to this conductor through spring 421 and its make contact. Spring 453 moves into engagement with its break contact, thereby applying positive to the first nineteen contacts of the bank engaged by wiper A of the refund switch, completing a circuit through that wiper through spring 553 and its break contact, through the winding of motor magnet 502 to negative, operating that motor magnet which interrupts its own circuit by opening springs 553 to advance the wiper one step. The switch operates in a buzzerlike fashion until wiper A engages the twentieth bank contact which does not contain positive potential and the switch comes to rest in its normal position. Restoration of relay 406 closes spring 440 against its break contact, thereby completing a circuit from positive through spring 447 and its break contact, spring 443 and its break contact, springs 441 and 442 and their respective break contacts in multiple, spring 440 and its break contact, wiper A and the contact on which the wiper is resting, through the winding of magnet 416 to negative, operating magnet 416 which interrupts the above circuit by opening springs 447 causing the switch to operate in a buzzerlike fashion until wiper A moves to its twentieth bank contact, at which time the circuit is opened and the switch comes to rest.

Restoration of relay 402 opens springs 433, removing positive from conductor 467, thereby opening the circuit through the lower winding of relay 417, permitting that relay to restore, thereby restoring the subtracting device to normal.

Late scratch of two or more runners

It occasionally happens that more than one runner will be scratched at the last minute. In the foregoing description of the late scratch operation with but one runner scratched, the sum registered on that runner was set up in the refund relays. Obviously if two runners are scratched simultaneously, different provisions must be made to register the sum to be refunded in the refund relays, since that sum is the sum of the totals then registered on the two runners.

It will be noted that in Fig. 5 the hundreds digit section of the refund relays is equipped with a manually operated decade switch, the wiper 508 of which can be moved manually to a contact corresponding to the value of the hundreds digit of the sum to be refunded. Each of the other digit sections of the refund relays is similarly equipped and the attendant will ascertain the sum to be refunded and manually set the decade switches accordingly. With the sum thus registered, the operation of subtracting the amount to be refunded from the total on each cycle of the computer is carried out as hereinbefore explained.

It will also be noted in Fig. 6 and in Fig. 7 that the total and runner arms of the bridge are each equipped with decade switches to permit manually setting the resistance value of that arm. This provision is made primarily for the purpose of testing and permits the attendant to set the value of these arms at will for that purpose.

Throughout the foregoing description, the code of five conductors per digit, five relays per digit with two relays operated simultaneously to complete a digit, has been used. The computer of the present invention can be used with other codes; for example, the code in which there are six conductors and relays per digit, three of which relays must be operated simultaneously to register the digit. Modification of the circuit shown by way of example to include such code is contemplated within the teachings of the invention.

Recycling the computer

There are instances where the totalisator may initiate a new indication cycle before the computer has completed its cycle and it is necessary to provide for recycling the computer under these conditions. Thus, for example, if in a race the start is effected a few seconds after a normal indication cycle, the racing start steward may operate his switch to stop the further sale of tickets before the computer has run out its cycle. Immediately the racing steward operates his key, the totalisator recycles to register the final total in the pool and also the final total on each runner. Such recycling reapplies positive to the conductor leading to the bridge actuating relays and recycling of the computer will be effected.

If the computer is operating under normal conditions, that is, there are no late scratches, relay 301 will be in its normal position. If in the process of a cycle, relay 209 will be operated as explained above to extend the control circuits from the C and D wipers of the access switch. Positive placed on the conductor leading to the actuating relays under these circumstances will re-operate relay 206, which, by closing spring 241 against its make contact, will extend a circuit from positive through spring 249 and its make contact, through the winding of relay 210 to negative. Relay 210 operates over this circuit and by closing spring 253 against its make contact extends a circuit from positive through the first twelve multipled together contacts of the bank of the access switch engaged by wiper A, through that wiper, spring 253 and its make contact, spring 259 and its break contact, through the winding of motor magnet 212 of the access switch to negative. The motor magnet operates over this circuit and by opening spring 259 from its break contact interrupts the circuit and falls back to advance the wipers one step; whereupon the circuit is again closed and the switch re-operates in buzzerlike fashion until wiper A moves to the thirteenth bank contact. A circuit is now closed from positive on multipled together contacts 13 to 19 inclusive, engaged by the B wiper of the access switch, through spring 259 and its make contact, through the winding of motor magnet 212 to negative, and the buzzerlike operation of the switch is continued over this circuit until wiper B engages its twentieth bank contact

and the switch is thus brought to rest in its normal position.

Operation of relay 210 at spring 255 and its make contact closes a circuit from positive through the upper winding of relay 203 to negative, operating that relay to reset the balancing chain in the hereinbefore explained manner.

Disengagement of wiper A from positive removes that potential from conductor 283, thereby to restore relays locked up to that conductor.

Energization of relay 206 initiates a new cycle of operation of the computer so that the odds placed upon the indicators represent the final odds corresponding to the final sums indicated.

If the computer is operating under late scratch conditions, relay 301 will be in its operated condition and the positive received from the totalisator will close a circuit through spring 321 and its make contact and through the winding of relay 302 to negative.

Relay 302 operates and at spring 324 and its make contact extends a circuit from positive over conductor 362 through spring 249 and its make contact, through the winding of relay 210 to negative, operating that relay to reset the access switch as before.

In due course of the late scratch cycle of operations, relay 308 is operated and at spring 337 and its make contact closes a circuit for relay 206, thereby to operate that relay to initiate a new cycle of operation of the computer under late scratch conditions.

From the foregoing it will be apparent that the computer of the present invention possesses many advantages over the manual setting of a line of odds as heretofore practiced. With a maximum of twelve runners, the computer operates automatically each time the totalisator cycles, and computes the odds on each runner and adjusts appropriate indicators to indicate those odds. The entire line of odds can be set in approximately five seconds. In cases where late scratches have occurred and correcting the total is necessary on each cycle, a slightly longer time is required; however, under these conditions less than twelve runners are involved, and in certain instances the required line of odds can be set in approximately six seconds.

While I have chosen to illustrate my invention by illustrating and described a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

1. In a computer, a Wheatstone bridge; means including relays for setting a first arm of said bridge to an ohmic value corresponding to a total sum; means including relays for setting a second arm of said bridge, adjacent the first arm, to an ohmic value corresponding to a second sum; means including manual switches for setting a third arm of said bridge, adjacent the second and opposite the first arm, to an ohmic value bearing the same percentage relation to a fixed resistance value as the percentage of said total sum to be considered bears to the total sum; a fourth arm for said bridge adjacent the first and third arms and opposite the second arm, comprising a plurality of fixed resistors connected together in series and having a total value equal to the product of the fixed resistance in said third arm and the largest ratio to be handled by the bridge; means for energizing the bridge; a chain of relays operating sequentially to by-pass the first resistors in said fourth arm, one at a time; means for stopping said chain relays when said bridge is in balance; and means controlled through the chain relay energized when said chain is stopped for indicating the ratio the part of the first sum that is to be considered bears to said second arm.

2. A computer bridge as claimed in claim 1, in which the resistance in the fourth arm has a maximum value one hundred times the maximum value of the resistance in the third arm so that the bridge can handle ratios up to one hundred to one.

3. In a computer, a Wheatstone bridge; means including relays for setting a first arm of said bridge to an ohmic value corresponding to a total sum; means including relays for setting a second arm of said bridge, adjacent the first arm, to an ohmic value corresponding to a second sum; means including manual switches for setting a third arm of said bridge, adjacent the second and opposite the first arm, to an ohmic value bearing the same percentage relation to a fixed resistance value as the percentage of said total sum to be considered bears to the total sum; a fourth arm for said bridge, adjacent the first and third arms and opposite the second arm, comprising two sets of fixed resistors, each of which contains a plurality of resistors connected in series, which sets are connected together in series and have a total ohmic value equal to the product of the fixed resistance in said third arm and the highest ratio to be handled by the bridge; means for energizing the bridge; a chain of relays associated with said fourth bridge arm; contacts on each chain relay for by-passing a resistor in the first one of said sets of resistors when the relay is energized; contacts on each chain relay for by-passing a resistor in the second of said sets of resistors; a range relay operated to shift the bridge circuit from the first to the second set of contacts thereby to permit bringing the bridge into balance at a number of points twice as great as the number of relays in the chain; and means controlled through said chain relays when the bridge is in balance for indicating the ratio that part of the total sum to be considered bears to said second sum.

4. The combination with an odds computer having a bridge into one arm of which a resistance indicative of a total sum is placed by relays actuated by potentials indicative of a code on a total bus, and into another arm of which resistances indicative of individual runner sums are placed on at a time by relays actuated by potentials indicative of a code on individual runner busses and the bridge balanced to determine the approximate odds on the individual runners; of a late scratch control comprising: a group of refund storage relays; key means for scratching the runner and for connecting the refund storage relays to the individual runner bus corresponding to the scratched runner to operate certain ones of the relays and thereby store the sum then registered on that runner in said relays; late scratch control relays; a subtracting device; means in said late scratch control relays for connecting a register switch for each order in said subtracting device to said total bus and for stepping said switches to positions indicative of the sum registered on the total bus; means for operating said subtracting device to subtract

from said total sum the sum registered in said refund storage relays; and means for placing a resistance indicative of the difference between said sums into the total arm of the bridge as a total against which resistances indicative of the individual runner sums are balanced to determine the approximate odds on the runners.

5. In a ratio computing device, a bridge comprising: a total arm comprising a plurality of resistors connected in series; means including a group of relays a plurality of which are operated simultaneously to by-pass a portion of said resistors and thereby adjust the resistance of said bridge arm to a desired value; a second arm comprising a plurality of resistors connected in series, a connection between one end of said bridge arm and one end of said second arm; means including a group of relays a plurality of which are operated simultaneously to by-pass a portion of said resistors and thereby adjust the resistance of said second arm to a desired value; a correcting arm comprising a plurality of resistors, a connection between one end of said correcting arm and the other end of said second arm; manual contactors for connecting a portion of said correcting arm resistors together in series thereby to adjust the correcting arm to a desired value; a balancing arm comprising a plurality of resistors connected together in series, a connection between one end of said balancing arm and the other end of said correcting arm, a connection between the other end of the balancing arm and the other end of said total arm; means including a battery connected between the junction of the total and balancing arms and the junction between the correcting and second arms for energizing the bridge; means including a chain of relays adapted to operate automatically and in sequence for by-passing the resistors in the balancing arm, one at a time, and thereby bring the bridge into balance; a control unit connected between the junction of the total and second arms and the junction between the balancing and correcting arms of the bridge; means including a relay in said control unit for stopping said chain of relays when the bridge is in balance; an indicator; and means including a relay operated by said control unit relay through said chain relays for operating said indicator to indicate the ratio that the resistance value in said total arm bears to the resistance value in said second arm.

6. A computing device as claimed in claim 5, in which the resistors in the total and second bridge arms are each divided into subgroups and in which there are a plurality of control relays for each subgroup and in which a plurality of the relays in each of the subgroups are energized simultaneously to adjust the ohmic value of the arm.

7. A computing device as claimed in claim 5, in which the total and second bridge arms each contain a group of resistors having one ohm each, a group having ten ohms each, a group having one hundred ohms each, a group having one thousand ohms each, a group having ten thousand ohms each, and a group having one hundred thousand ohms each, and in which there is a group of control relays for each group of resistors and in which a plurality of said relays are operated simultaneously to adjust the ohmic value of the arm.

8. A computing device as claimed in claim 5, in which the resistors in the total and second bridge arms are each divided into subgroups and in which there are five control relays per subgroup and in which two of the relays in each subgroup are energized simultaneously to adjust the ohmic value of the arm.

9. A computing device as claimed in claim 5, in which the balancing arm has a group of resistors for high range and a group of resistors for low range, and in which the control unit upon completion of the bridge makes a preliminary test to determine the range in which the chain relays are to by-pass the resistors one at a time to balance the bridge.

10. A computing device as claimed in claim 5, in which the balancing arm has a group of resistors for high range and a group of resistors for low range, and a switching relay operated through the first relay in the chain under the control of the control unit to determine the range in which the remaining relays in the chain are to by-pass the resistors one at a time to balance the bridge.

11. In a computer, a subtracting device comprising: a pair of stepping switches for each order of a sum, each switch having banks of contacts engaged by wipers over which contacts the wipers sweep step-by-step as the switch steps; means including relays for placing potentials on certain contacts in the banks of the first ones of said pairs of switches in accordance with a code to register a total in the banks of contacts; means for stepping said first switches until their wipers engage said certain contacts thereby to set the switches to correspond to the total registered in the banks of contacts; means including relays for placing potentials on certain ones of the contacts in the banks of contacts of the second switch of each pair of switches to register a subtrahend in those banks of contacts; means controlled by the first switch of each of said pairs of switches for stepping that pair of switches in unison step-by-step; a relay energized over a circuit closed through a wiper of the second switch of each pair when that wiper engages the contact upon which said potential has been placed for stopping that pair of switches; and means including the wipers of the first switch of each pair of switches and the contacts then engaged thereby for transmitting from said subtracting device potentials in accordance with a code indicating the difference between said total and subtrahend.

12. In a computer in which numbers are registered by simultaneously operating a plurality of relays per order over circuits completed over a multi-conductor per order bus in accordance with a particular code; a stepping switch for each order; a plurality of wipers on each switch corresponding in number to the number of relays simultaneously operated to register a digit in the order; a bank of contacts for each switch including a row of contacts for each wiper; relay means for connecting the bus to said banks thereby to apply potential to certain contacts therein in accordance with said code; a test relay for each wiper; circuits for said test relays completed when the associated wiper engages a contact containing said potential to operate the relay; a motor magnet for each switch; a circuit for each motor magnet over which impulses are delivered to the magnet to operate it thereby to step the wipers over said banks; and normally closed contact means for each test relay included in the circuit of the associated motor magnet to open that circuit when the test relays associated with a switch are operated simultaneously thereby to stop the switch with the wipers engaging

contacts corresponding to the digit registered in the switch.

13. In a computer in which numbers are registered by simultaneously operating a plurality of relays per order over circuits completed over a multi-conductor per order bus in accordance with a particular code; a stepping switch; a plurality of wipers on said switch corresponding in number to the number of relays simultaneously operated to register a digit in the switch; a bank of contacts containing a row of contacts for each wiper of said plurality of wipers; means including a relay for connecting the bus to said bank thereby to apply potential to certain contacts therein in accordance with said code; a test relay for each wiper; a motor magnet for said switch; a circuit for said motor magnet over which impulses are delivered to the magnet to operate it thereby to step the wipers over said bank; and means including normally closed contacts on said test relays and included in said motor magnet circuit to open that circuit when said test relays are operated simultaneously thereby to stop the switch with the wipers engaging contacts corresponding to the digit registered in the switch.

14. In a computer in which numbers are registered by simultaneously operating two of five relays per order over a five wire per order bus in accordance with a particular code; a stepping switch; a pair of wipers in said switch; a bank of contacts for each wiper; means including a relay for extending the bus to said banks of contacts to place a potential on contacts in each bank in accordance with said code thereby to register a digit in the switch; a motor magnet for said switch; a circuit for said magnet over which impulses are delivered to the magnet to operate the switch to move the wipers step-by-step over their banks; a pair of test relays; a circuit for each relay completed through an associated one of said wipers when that wiper encounters said potential for operating the relay; and a pair of normally closed contacts on each relay connected in the circuit of said motor magnet each in parallel with a corresponding contact on the other relay, which contacts are opened when the relays are operated simultaneously to stop the switch on contacts corresponding to the digit registered therein.

15. In a computer, a subtracting device comprising: a pair of stepping switches per order; a bank of contacts for each switch; a plurality of rows of contacts in each bank; a wiper engaging each row of contacts; means including relays for applying potential to contacts in a plurality of rows in the banks of the first of said switches in each order in accordance with a code to register the digits of a total in said banks in reverse sequence so that the wipers on moving from starting contacts to the marked contacts take a number of steps equal to the difference between the value of each digit and ten; a motor magnet for each switch; a circuit for each magnet over which the magnet is operated to move the wipers step-by-step over its bank; relay means in the circuit of the first switch of the pair for each order operable when the wipers of said switch engage said marked contacts for opening the circuit of the motor magnet to stop the switch with the wipers in a position indicative of the value of the digit registered in the switch; means including a plurality of relays operated in accordance with a code for placing a potential on a contact in the bank of the second one of the pair of switches for each order to register the digits of a subtrahend in said banks in numerical order so that the wipers on moving from a starting contact to the marked contact take a number of steps equal to the numerical value of the digit; a stepping relay; a circuit for said stepping relay closed through normally closed contacts controlled by the motor magnet of said first switch; circuits for the motor magnets of said first and second switches closed through normally open contacts on said stepping relay to operate said magnets to step the switches in unison; a control relay; a circuit for said control relay closed through the wiper of said second switch when the wiper engages said marked contact to operate the control relay; normally closed contacts on said control relay included in the circuit of said stepping relay for opening the circuit of the stepping relay when the control relay operates thereby to stop said switches with the wipers of said first switch in a position corresponding to the difference between said total and subtrahend.

16. The combination with a totalisator in which total sums are registered on indicators by simultaneously operating a plurality of relays per order over circuits completed over a multi-conductor per order bus in accordance with a particular code and in which each of a plurality of individual runner sums are similarly registered over similar busses individual to the runner; of an odds computer comprising: a bridge; a group of actuating relays associated with said bridge; a first group of code relays for a first arm of said bridge; a second group of code relays for a second arm of said bridge; an access switch operable step-by-step under the control of said actuating relays; switching relay means operated through said actuating relays to connect said total bus to said first code relays to operate the relays and thereby adjust the resistance of said first bridge arm to a value indicative of the total sum then registered in the totalisator; a locking circuit for said operated code relays closed through said access switch; means in said actuating relays for operating said switching relays to disconnect said total bus from said first code relays; a switching relay for each individual runner; means in said actuating relays for closing a circuit through said access switch to the switching relay for the first runner to connect the individual runner bus for that runner to the second group of code relays to operate the relays and thereby adjust the resistance of said second arm to a value indicative of the sum registered on the first runner; a third arm for said bridge adjacent to said second arm and opposite said first arm; a fourth arm for said bridge adjacent to said first and opposite said second arm; means for energizing said bridge; means including relays operable to vary the resistance of said fourth bridge arm for bringing the bridge into balance; a relay operable when the bridge is in balance; and means controlled by said latter relay for operating said access switch thereby to disconnect said first runner bus from and to connect the second runner bus to said second code relays.

17. The combination with a totalisator in which total sums are registered on indicators by simultaneously operating a plurality of relays per order over circuits completed over a multi-conductor per order bus in accordance with a particular code and in which each of a plurality of individual runner sums are similarly registered over similar busses individual to the runner; of an odds computer comprising: a bridge;

a group of actuating relays associated with said bridge; a first group of code relays for a first arm of said bridge; a second group of code relays for a second arm of said bridge; an access switch operable step-by-step under the control of said actuating relays; a bus in said computer: switching relay means operated through said actuating relays to connect said total bus to said computer bus and the computer bus to said first code relays to operate the relays and thereby adjust the resistance of said first bridge to a value indicative of the total sum then registered in the totalisator; a locking circuit for said operated code relays closed through said access switch; means in said actuating relays for operating said switching relay means to disconnect said total bus from said computer bus and to disconnect said computer bus from said first code relays and connect it to said second code relays; a switching relay for each individual runner; means in said actuating relays for closing a circuit through said access switch to the switching relay for the first runner thereby to connect the first runner bus through the computer bus to said second code relays to operate those relays to adjust the resistance of said second arm to a value indicative of the sum registered on the first runner; a third arm for said bridge adjacent to said second arm and opposite said first arm; a fourth arm for said bridge adjacent said first and opposite said second arm; means for energizing said bridge; means including relays operable to vary the resistance of said fourth bridge arm for bringing the bridge into balance; a relay operable when the bridge is in balance; and means controlled by said latter relay for operating said access switch thereby to disconnect said first runner bus from and to connect the second runner bus to said second code relays.

18. A computer as claimed in claim 17, characterized in that the relay operated when the bridge is in balance controls the access switch to connect the individual runner busses to the second code relays one at a time and in sequence, thereby to enable the computer to determine the ratios between the total sum and the individual runner sums.

19. In a computer, a stepping switch; a plurality of rows of contacts in said switch; a wiper for each row of contacts; a motor magnet; a circuit over which said motor magnet is operated intermittently to step said wipers over said contacts; a multi-conductor bus; means including a relay for extending said bus to said contact rows so that potentials on a plurality of said bus conductors, in accordance with a code, will mark a corresponding position in the switch; means for closing said motor magnet circuit to operate said switch in search of said marked position; a relay for each wiper; contacts on said relays included in said motor magnet circuit operated when the wipers are in said marked position to stop the switch in that position; a slow to release relay maintained operated while said motor magnet is operating to move said wipers and restored when said switch is stopped in said marked position; a second circuit for said motor magnet; means controlled by said slow to release relay in restored position for closing said second circuit a plurality of times to operate the switch a predetermined number of steps from said marked position; a group of code relays; means including relays for extending said bus conductors to said code relays; and means for closing circuits through said wipers and the contacts then engaged thereby and said bus conductors to operate said code relays in accordance with the final position of said switch.

20. A computer subtracting device comprising: a stepping switch; a pair of wipers on said switch; a row of contacts for each wiper; a motor magnet for said switch; a circuit for said switch intermittently closed to operate the magnet to step the wipers over said rows of contacts; a five wire bus; connections between said bus and contacts for placing a potential on the contacts in accordance with a code to register the digits between nine and zero in sequence reverse to the stepping of the wipers; a pair of test relays; circuits for said test relays completed through said wipers and potential carrying contacts; contacts on said test relays included in the motor magnet circuit for opening the circuit when the test relays are energized simultaneously to stop the switch with the wipers in a position corresponding to the digit marked on said contacts; means comprising a second intermittently closed circuit for said switch and relays for controlling that circuit for stepping said wipers from said marked position a number of steps corresponding to a digit of a subtrahend; and means for applying a potential to said wipers and therethrough to the contacts they engage to transmit from the switch to said bus a code indicative of the difference between said first marked digit and said subtrahend.

21. A computer subtracting device as claimed in claim 20, in which there is a stepping switch for each order of a sum and in which there are borrow circuits between switches over which the next higher order switch is operated an additional step whenever the subtrahend digit of the next lower order is greater than the first marked digit of that order.

22. A computer subtracting device as claimed in claim 20, in which the means for stepping the switch wipers from the first marked position comprises a second stepping switch in the banks of contacts of which the subtrahend digit is marked by a potential placed on a contact in the bank corresponding to the value of the digit and in which a control relay circuit is closed through the switch circuit and potential carrying contact to operate the relay and in which a contact on the control relay is thereby opened to stop both switches.

23. An odds computer for use in connection with a totalisator in which sums registered in a total pool and sums registered on each runner in that pool are indicated under the control of multi-relay indicators in which a plurality of relays are energized simultaneously to effect indication of each order of said sums; an indication bus comprising a group of conductors for each order of each of said sums corresponding in number to the number of relays per order in said indicators; a computer bus comprising a group of conductors for each order corresponding in number to the conductors in the indication bus; means including a relay for connecting said computer bus to the total portion of said indication bus; a total bridge arm comprising a plurality of resistors for each order of said total sum and a plurality of relays per order; means including a relay for connecting said computer bus to said total arm relays thereby to close circuits to operate the total arm relays necessary to set the resistance of the total arm to an ohmic value corresponding to the sum then indicated in the total pool; a runner arm in said

bridge comprising a plurality of resistors for each order and a plurality of relays per order; means including a stepping switch for disconnecting said computer bus from said total portion of said indication bus and from said total bridge arm; means including relays operated through said stepping switch for selectively connecting said computer bus to the individual runner portions of said indication busses one at a time and for connecting the computer bus to said individual runner bridge arm relays thereby to close circuits to operate the runner bridge arm relays necessary to set that arm of the bridge to an ohmic value corresponding to the sum then registered on the selected runner; a correcting arm for said bridge comprising a plurality of resistors and manual levers for setting the ohmic value of the arm to correspond to the portion of the pool available for distribution; a balancing arm for said bridge comprising a plurality of resistors and a chain of relays through the contacts of which the ohmic value of the arm is varied in definite steps; a plurality of odds setup relays; a plurality of odds indicators, one for each runner in said pool; means including a relay operated through said stepping switch for connecting to said odds setup relays the indicator corresponding to the runner then connected to said runner arm of the bridge; a bridge control; means controlled by said bridge control when said bridge is balanced and operating through said balancing arm relays for energizing one of said odds setup relays; and means controlled by said energized odds setup relay for operating said associated odds indicator to indicate the approximate odds on the runner.

24. An odds computer for use in connection with a totalisator in which sums registered in a total pool and sums registered on each runner in that pool are indicated under the control of multi-relay indicators in which two of five relays are energized simultaneously to effect indication of each order of said sums; an indication bus comprising five conductors for each order of each of said sums; a computer bus comprising five conductors for each digit; means including a relay for connecting said computer bus to the total portion of said indication bus; a total bridge arm comprising a plurality of resistors for each digit of said total sum and five relays per order for connecting said resistors in the arm; means including a relay for connecting said computer bus to said total arm relays thereby to close circuits to operate two of said relays per order to set the resistance of the total arm to an ohmic value corresponding to the sum then indicated in the total pool; a runner arm in said bridge comprising a plurality of resistors for each order and five relays per order for connecting said resistors in the arm; means including a stepping switch for disconnecting said computer bus from said total portion of said indication bus and from said total bridge arm; means including relays operated through said stepping switch for selectively connecting said computer bus to the individual runner portions of said indication busses one at a time and for connecting the computer bus to said individual runner bridge arm relays thereby to close circuits to operate two of said runner bridge arm relays per order to set that arm of the bridge to an ohmic value corresponding to the sum then registered on the selected runner; a correcting arm for said bridge comprising a plurality of resistors and manual levers for setting the ohmic value of the arm to correspond to the portion of the pool available for distribution; a balancing arm for said bridge comprising a plurality of resistors and a chain of relays through the contacts of which the ohmic value of the arm is varied in definite steps; a plurality of odds setup relays; a plurality of odds indicators, one for each runner in said pool; means including a relay operated through said stepping switch for connecting to said odds setup relays the indicator corresponding to the runner then connected to said runner arm of the bridge, a bridge control; means controlled by said bridge control when said bridge is balanced and operating through said balancing arm relays for energizing one of said odds setup relays; and means controlled by said energized odds setup relay for operating said associated odds indicator to indicate the approximate odds on the runner.

25. In a computer, a stepping switch; a plurality of rows of contacts in said switch; a wiper for each row of contacts; a motor magnet; a circuit over which said motor magnet is operated intermittently to step said wipers over said contacts; a multi-conductor bus; means including a relay for extending said bus to said contact rows so that potentials on a plurality of said bus conductors, in accordance with a code, will mark a corresponding position in the switch; means for closing said motor magnet circuit to operate said switch in search of said marked position; a relay for each wiper; contacts on said relays included in said motor magnet circuit operated when the wipers are in said marked position to stop the switch in that position; a second stepping switch; a motor magnet in said second switch; a stepping relay associated with said second stepping switch; a slow to release relay associated with said switches and restored when said first switch is stopped on said marked contacts; a circuit for said stepping relay closed by said slow to release relay in restored position to operate that relay; circuits for said motor magnets closed by said stepping relay to step said switches in unison; a wiper in said second switch; a row of contacts engaged by said wiper; means for applying potential to a particular contact in said row to mark that contact; means including a relay operated over a circuit completed through said second switch wiper and said marked contact for opening the circuit of said stepping relay thereby to stop said switches; a group of code relays; means including relays for extending said bus conductors to said code relays; and means for closing circuits through said conductors to operate said code relays in accordance with the final position of said first switch.

26. In a subtracting device having a stepping switch for each order of a sum, which switches have banks of contacts in which digits appear in sequence reverse to the stepping of the switch, and which have a wiper for each row of contacts, and a motor magnet for moving the wipers over said contacts to set the switch on particular contacts to register therein the digits of a sum, and in which the motor magnets are then operated a plurality of times according to the value of a digit in the corresponding order of a subtrahend to reset the wipers on contacts indicative of the value of the corresponding digit of the difference between said sum and said subtrahend; a borrow wiper on each of said switches; a borrow relay associated with each switch; a circuit for each borrow relay extended through

the borrow wiper of the next lower order switch and the tenth bank contact of that switch; means for energizing said circuit in parallel with the motor magnet of said next lower order digit switch when that magnet is energized to move said borrow wiper off of said tenth contact to operate said borrow relay; a circuit for the motor magnet of the switch with which the operated borrow relay is associated extended through contacts closed by said borrow relay in operated position; and means for closing said circuit when said switch wipers have been reset to operate said associated switch an additional step to lower the value of the corresponding digit in accordance with said borrow.

OSCAR C. LEVY.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,087,039	McMaster	July 13, 1937
2,108,146	Simpson	Feb. 15, 1938
2,123,142	McMaster	July 5, 1938
2,271,508	Gordon	Jan. 27, 1942
2,302,025	Gould	Nov. 17, 1942
2,346,616	Saxby	Apr. 11, 1944
2,346,869	Poole	Apr. 18, 1944

A620

Dec. 29, 1959 LE ROY J. LANGE 2,919,064

APPARATUS FOR SELECTING AND OPERATING ELECTRO-MECHANICAL REGISTERS

Filed Aug. 30, 1956 3 Sheets-Sheet 1

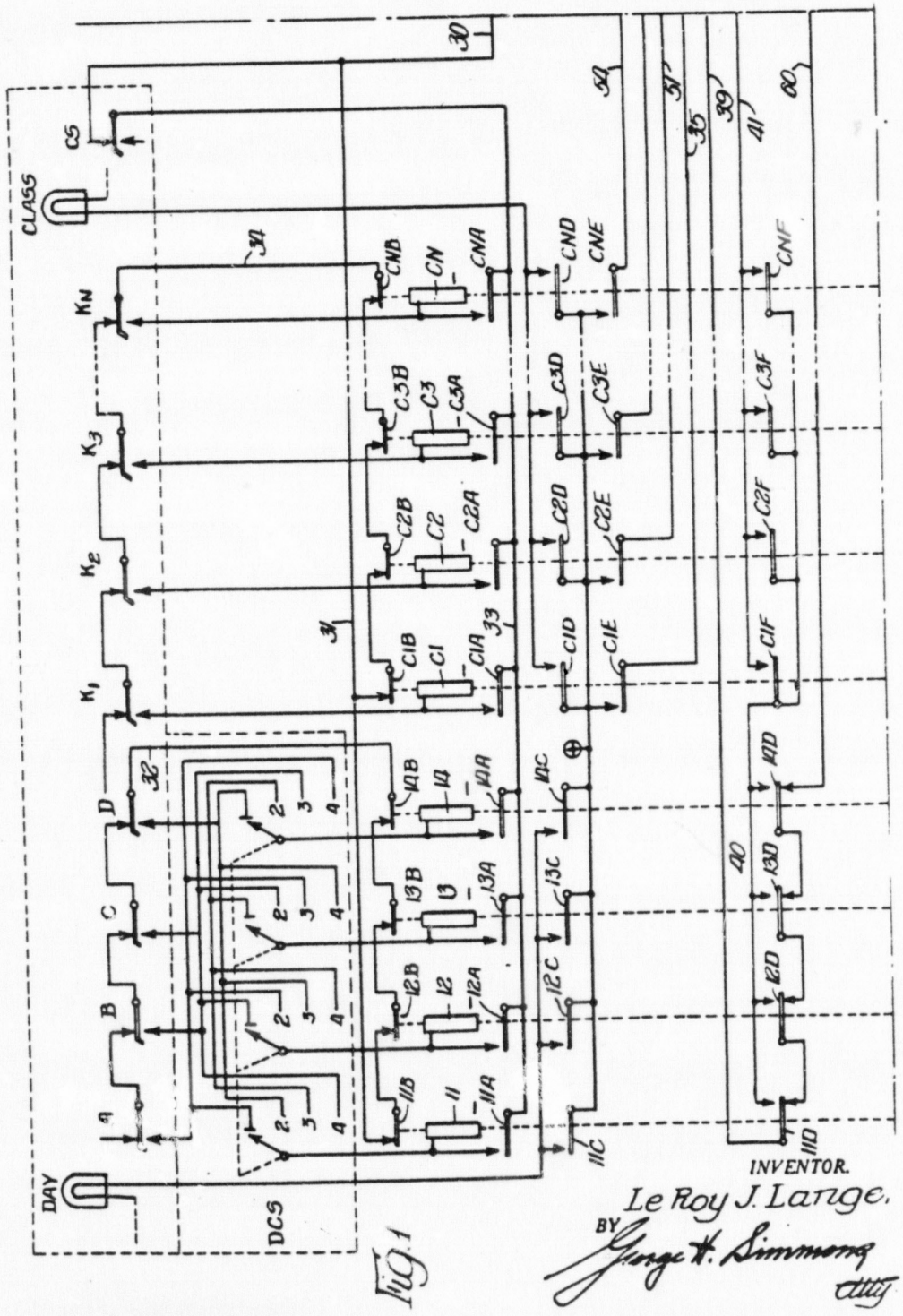


Fig. 1

Dec. 29, 1959 LE ROY J. LANGE 2,919,064

APPARATUS FOR SELECTING AND OPERATING ELECTRO-MECHANICAL REGISTERS

Filed Aug. 30, 1956 3 Sheets-Sheet 2

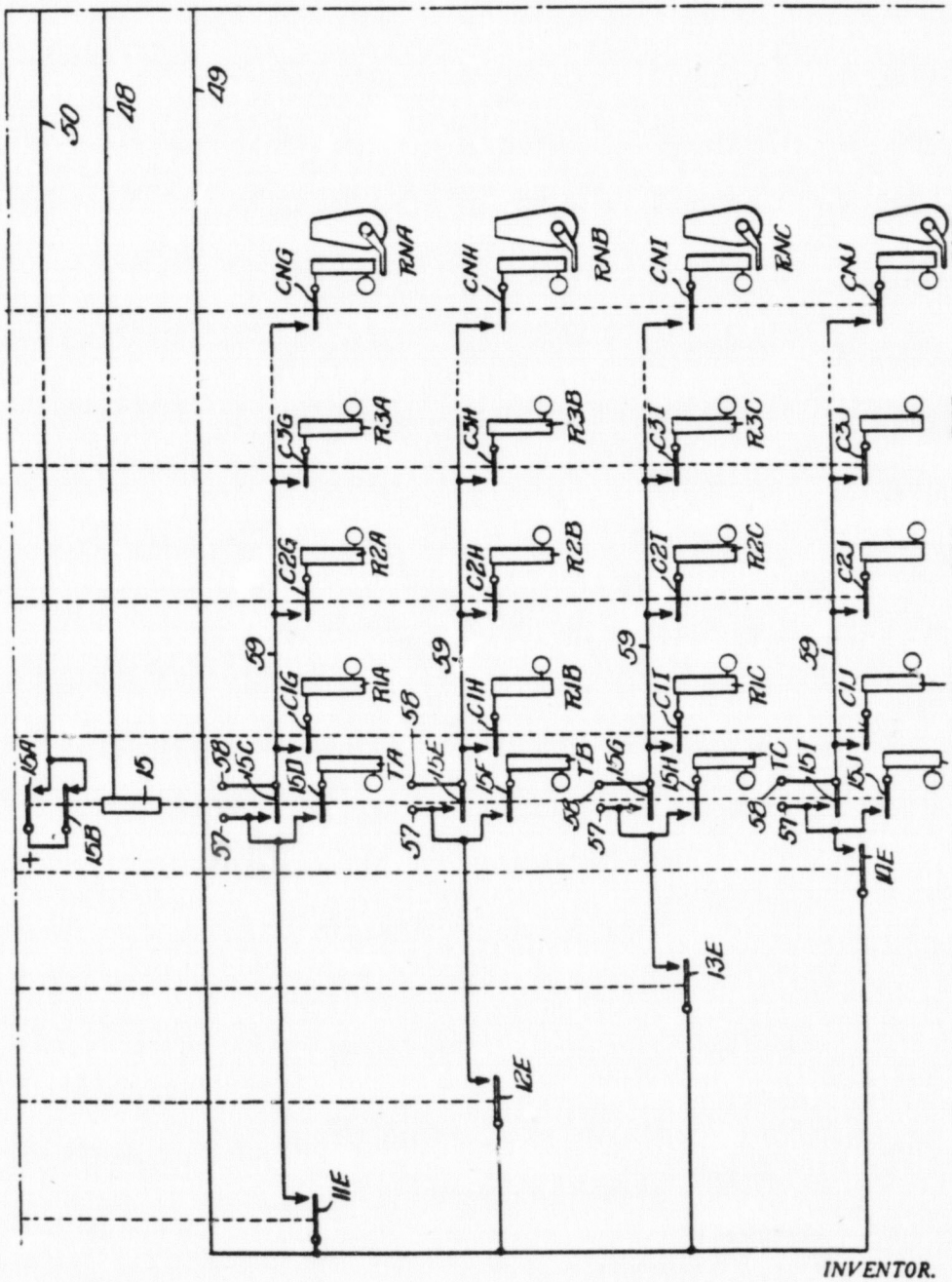


Fig. 2

INVENTOR.
LeRoy J. Lange.
BY
George H. Simmons
Atty

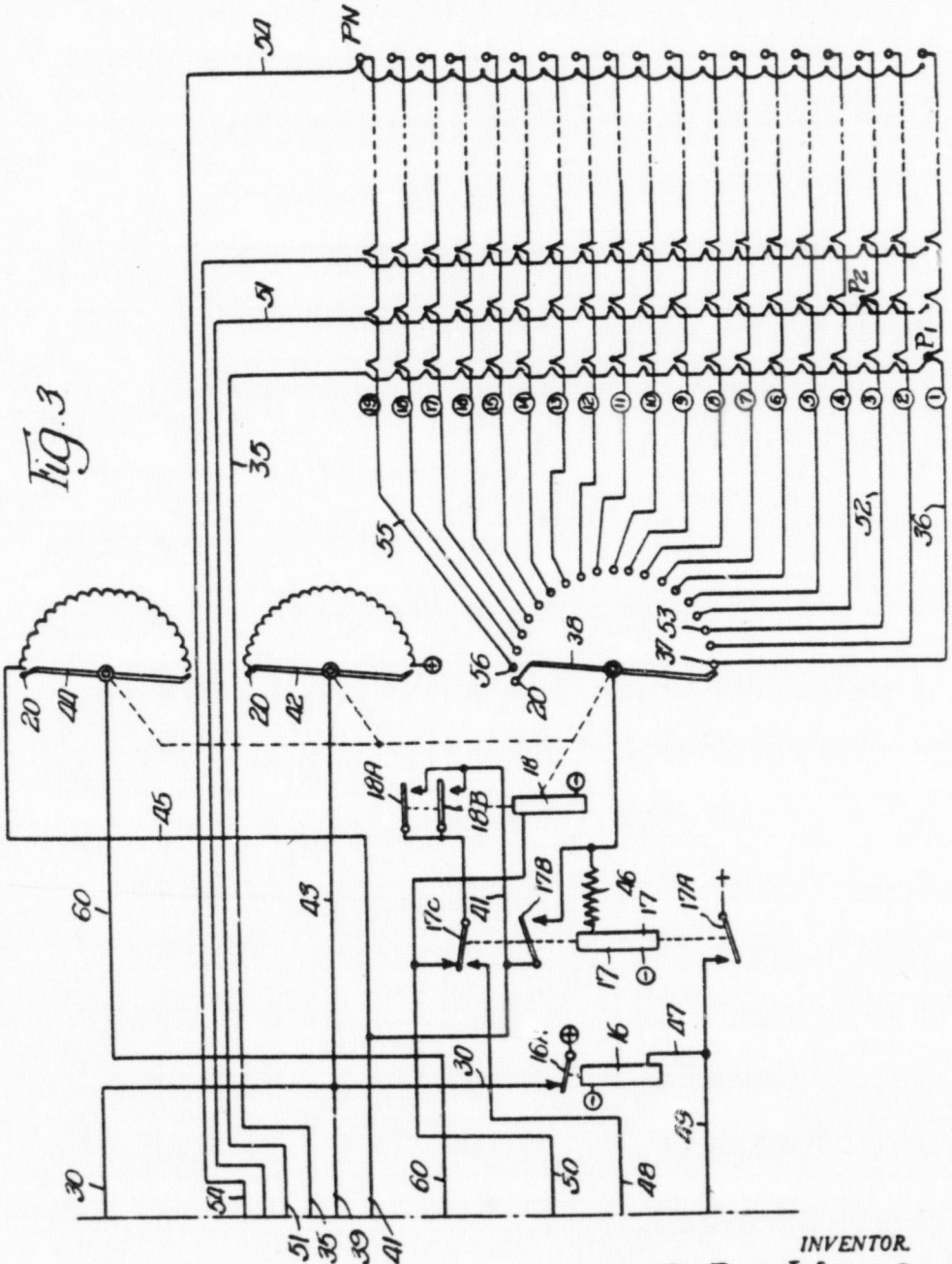
A622

Dec. 29, 1959 LE ROY J. LANGE 2,919,064

APPARATUS FOR SELECTING AND OPERATING ELECTRO-MECHANICAL REGISTERS

Filed Aug. 30, 1956 3 Sheets-Sheet 3

Fig. 3



INVENTOR.
LeRoy J. Lange.
BY
George H. Simmons
Atty

United States Patent Office

2,919,064

Patented Dec. 29, 1959

2,919,064

APPARATUS FOR SELECTING AND OPERATING ELECTROMECHANICAL REGISTERS

Le Roy J. Lange, Baltimore, Md., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application August 30, 1956, Serial No. 607,103

7 Claims. (Cl. 235—92)

This invention relates to apparatus for selecting and operating electro-mechanical registers and has for its principal object the provision of new and improved apparatus of this kind.

It is a main object of the invention to provide a group of total registers and a group of classification registers associated with each total register, together with apparatus for selecting and operating one of the total registers and one of the classification registers of the group associated with the selected total register.

Another object of the invention is to provide apparatus for operating the selected total and classification registers a number of times depending upon a predetermined value assigned to the selected classification register.

Another object of the invention is to provide apparatus for registering work orders assigned to one of a plurality of days and to register a predetermined number of time units on classification registers associated with the selected day register, thereby to register the total number of time units required of work orders assigned to the selected day and the number of time units in each of the classifications to which these work orders have been assigned.

Further objects, not specifically mentioned here, will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

Fig. 1 is a schematic diagram of the control keys of the apparatus and relays associated therewith;

Fig. 2 is a schematic diagram of the registers and circuits over which selected registers are operated; and

Fig. 3 is a schematic diagram of the stepping switch, plug board and relays through operation of which selected registers are operated.

The present invention relates to apparatus for operating selected registers in a group of registers, designated as classification registers, and includes a total register that is operated simultaneously with the classification registers to accumulate the total or sum of all registrations on the registers in the group. The apparatus includes a plurality of groups of classification registers each having a total register associated therewith, and also provides for the selection of one group of registers as well as for the selection of a register in the selected group.

One field in which the apparatus of the present invention has utility is in the registering of customers' service requests received by a public utility company such as a gas or electric company. Such service requests are required to be fulfilled with varying promptness; that is to say, some must be fulfilled as soon after receipt as possible, while others need not or cannot be fulfilled for several days. Thus, for example, a service interruption complaint must be responded to immediately, while a service turn-on or a service disconnect request need not be fulfilled until the day of moving in or moving out of a premises, which day may be several days after the request is received.

Not all service requests received by a public utility company require the same amount of time to fulfill. A service turn-on request in a premises where service has previously been given requires but a few minutes of the service man's time. Establishing service to a new premises obviously takes more time since leads and a meter must be installed.

To cope with this situation, the apparatus for registering service requests must be capable of permitting classifying the requests into as many classes as are needed and must be capable of registering the thus classified requests in accordance with the day to which the request is assigned to be fulfilled. The apparatus must be capable of operating the selected registers one or more times for each request, depending upon the number of time units required in the classification in which the request has been placed.

In one instance, a public utility company using the apparatus has required ten different classifications for its service requests and has required that the apparatus be capable of registering from one to nineteen time units, thereby to register a single service request. It is also required that the requests be registered for a selected one of four days, according to the assignment given to the request.

The apparatus shown in the drawings by way of example is designed to meet the above conditions. As shown, four day keys A, B, C and D are employed. Key A may be designated as today, key B as tomorrow, key C as day after tomorrow, and key D as day after day after tomorrow. Thus on Monday, services to be performed on Monday would be registered through an operation of key A, those to be performed on Tuesday through key B, those to be performed on Wednesday through key C, and those to be performed on Thursday through key D.

Intervening between the keys A to D, inclusive, and their associated relays is a day change switch DCS, having a number of wipers corresponding to the number of keys and a number of contacts engaged by each wiper also corresponding to the number of keys. Through this arrangement an operation of the key A on Monday operates day relay 11, key B operates day relay 12, key C operates relay 13, and key D operates relay 14. On Tuesday the day change switch is moved from its first to its second position, with the result that an operation of key A results in an operation of relay 12 so as to permit adding to the registrations made on Monday for work to be done on Tuesday, the work requests received on Tuesday and to be performed on that day. With the day change switch in its second position, relay 11 will be operated responsive to operation of key D to condition the apparatus for registration of assignments to be performed on Friday, since on Tuesday the following Friday is the day after the day after tomorrow.

The apparatus also includes a plurality of classification keys K1, K2, K3, with dotted lines indicating other keys intervening between K3 and the last key KN. To show the ten classifications employed in the above installation would complicate the drawings unnecessarily.

Associated with each classification key is a classification relay through an operation of which circuits are prepared to register a number of work units corresponding to the work unit requirement of the classification. The work unit may consist of a fraction of an hour, an hour, or several hours, depending upon the condition encountered. To permit such evalution of the classification and conversion thereof into units of itme, a plug board is provided. The plug board has a plurality of vertical bus bars corresponding in number to the number of classification relays, to one of which bars a circuit is extended by an operation of a relay. The plug board also has a

number of horizontal bars corresponding in number to the maximum number of units to be registered in any one classification. In the apparatus shown by way of example, nineteen units is the maximum that can be handled.

The apparatus and its operation will be best understood by referring to a specific example.

Registering class 1 work assigned to today

Assume that it is desired to register a service order which falls in class 1 and that the class 1 service orders require one time unit, and assume further that it is Monday and that the work is to be done on Monday. The attendant will first operate key A. A circuit may now be traced from positive on spring 16A and its break contact, conductor 30, conductor 31, through spring 11B and its break contact, spring 12B and its break contact, spring 13B and its break contact, spring 14B and its break contact, conductor 32, through the main spring and break contacts of keys D, C and B, to the main spring of key A now engaged with its make contact, through the first contact engaged by the first wiper of the day change switch DCS, through the winding of relay 11 to negative. Relay 11 operates over this circuit and at spring 11A closes a holding circuit for itself traceable over conductor 33, through the main spring and break contact of the correction switch CS to positive on conductor 30.

At spring 11C, relay 11 closes a circuit from positive through the day lamp to negative, lighting that lamp to indicate that the day has been selected. At spring 11B, relay 11 opens the previously traced circuit to the main springs of the day keys A, B, C and D to render further operations of those keys ineffective. At springs 11D and 11E, relay 11 closes points in circuits later to be described.

Since the registration assumed is to be in class 1, the attendant next operates key K1, extending the positive previously traced to conductor 31 through spring C1B and its break contact, spring C2B and its break contact, spring C3B and its break contact, through the other classification relay springs and their break contacts to spring CNB and its break contact, conductor 34, through the main springs and break contacts of the classification keys KN to K1, inclusive, through main spring K1 and its make contact, through the winding of relay C1 to negative. Relay C1 operates over this circuit and at spring C1A closes a holding circuit for itself to the positive previously traced to conductor 33.

At spring C1B, relay C1 opens the previously traced circuit to the main springs of the keys K1 to KN, rendering further operations of those keys ineffective.

At spring C1D, relay C1 closes a circuit from positive through the class lamp to negative, lighting that lamp to indicate that the class has been selected.

At spring C1E, relay C1 places positive on conductor 35, which conductor extends to the first vertical bus in the plug board. Since it is assumed that classification 1 calls for one time unit, a plug P1 will have been inserted to connect the first vertical bus to the first horizontal bus in the plug board, thereby placing positive on conductor 36 which extends to contact 37 in the bank of the stepping switch engaged by wiper 38.

The stepping switch is of known design and has a wiper such as 38 that engages a bank of twenty contacts, the twentieth contact being a home position contact to which the switch returns at the end of an operation. Wiper 38 is shown engaging contact 20 of its bank.

Relay C1 at springs C1G, C1H, C1I and C1J, prepares points in the circuits of the registers, one of which circuits is completed as will be hereinafter described.

At contact C1F, relay C1 closes a circuit which may be traced from positive through spring 16A and its break contact, conductor 30, conductor 39, through spring 11D and its make contact, conductor 40, through spring C1F and its make contact, conductor 41, through springs 18A and 18B in parallel and their respective break contacts, through spring 17C and its break contact, through the winding of motor magnet 18 of the stepping switch to negative. The motor magnet 18 operates over this circuit in preparation to advancing the wipers of the switch one step. Energization of magnet 18 opens springs 18A and 18B from their respective break contacts, thereby opening the circuit of the magnet 18 which falls back to advance the wipers one step.

Wiper 42 of the stepping switch thus advanced to the first contact in its bank, the contacts of which bank, with the exception of the home position contact 20, are all connected to positive, extends positive over conductor 43 to conductors 30 and 39, in multiple with the positive placed on these conductors by spring 16A and its break contact.

Wiper 44 of the stepping switch likewise sweeps over a bank of contacts, all of which, with the exception of the home position contact 20, are connected together and to conductor 45 connected to conductor 41 without particular effect at the moment.

As soon as magnet 18 has restored to advance the wipers to the first contacts in their respective banks, springs 18A and 18B again engage their respective break contacts to again close the circuit of the magnet 18 to repeat its cycle of operation. The stepping switch wipers are thus stepped step-by-step over their bank of contacts in buzzer-like action, this operation continuing until wiper 38 engages contact 37 upon which positive was placed as above.

A circuit may now be traced from this positive through wiper 38, through resistance 46, through the winding of relay 17 to negative. Relay 17 being a low impedance relay operates rapidly, and at spring 17C opens the circuit of the motor magnet 18 before that magnet has energized sufficiently to advance the wipers another step. At spring 17A and its make contact, relay 17 places positive on conductor 47 closing a circuit through relay 16 to negative to operate relay 16. At springs 16A, relay 16 removes positive from conductors 30 and 39; however, positive is maintained on these conductors through conductor 43, wiper 42, and the positive on the bank contact now engaged by that wiper.

Positive potential being maintained on conductor 41 through the engagement of springs C1F with its make contact, and engagement of spring 11D with its make contact, relay 17 at spring 17B closes a holding circuit for itself to maintain the relay operated so long as positive remains on conductor 41.

At spring 17C, relay 17 closes a circuit which may be traced from positive on conductor 41 through springs 18A and 18B, through their respective break contacts, spring 17C and its make contact, conductor 48, through the winding of relay 15 to negative, operating relay 15. Relay 15, at spring 15D, closes a circuit which may be traced from positive on conductor 47 over conductor 49, through spring 11E and its make contact, through spring 15D and its make contact, through the winding of total register TA to negative, energizing the register TA. A branch of this circuit extends through spring 15C and its make contact, spring C1G and its make contact, through the winding of the magnet of register R1A to negative, energizing that magnet.

The registers employed in this apparatus are of electromechanical type commonly known in the trade as "Veeder Counters," and upon each energization of the magnet of the register the mechanical counter is advanced one step to register one unit.

At springs 15A and 15B, which are connected in parallel, and their respective make contacts, relay 15 extends positive to conductor 50, thence through the winding of motor magnet 18 to negative, energizing that magnet preparatory to advancing the wipers of the stepping switch one step.

At springs 18A and 18B and their respective break contacts, magnet 18 opens the previously traced circuit for relay 15, permitting that relay to restore. Restoration of the relay 15, at springs 15A and 15B, opens the previously traced circuit for magnet 18, permitting that magnet to restore, thereby to advance the wipers of the stepping switch one step, bringing these wipers into engagement with their respective home position contacts 20 which are open contacts. At springs 15C and 15D, restoration of relay 15 opens the circuits previously traced to registers TA and R1A, which restore. Wiper 42 thus moving out of engagement with its bank contacts that are connected to positive, removes positive from conductors 43, 30 and 39, thus permitting restoration of relay C1 and relay 11, which were held in operated position by this positive. Removal of positive from conductor 39 and restoration of relays 11 and C1 removes positive from conductor 41 to open the holding circuit of relay 17, permitting that relay to restore and remove positive from relay 16, permitting that relay to restore, thereby to restore the equipment to normal.

Thus it will be seen that through the operation of key A and key K1, one time unit has been registered in the total day register TA and also in the classification register R1A.

Registering class 2 work assigned to today

Assuming that it is still Monday and that a class 2 work order is to be assigned to be performed today, and assuming further that class 2 work orders require three units of time, the operation is as follows:

The attendant will operate key A to operate relay 11 as before, and will operate key K2 to operate relay C2 which at spring C2A and its make contact closes a holding circuit for itself from positive on conductor 33 as before. At spring C2E and its make contact, relay C2 places positive upon conductor 51 which is connected to the second vertical bus in the plug board. Since, as assumed above, class 2 work orders require three units of time, a plug P2 will connect the second vertical bus to the third horizontal bus to extend positive over conductor 52 to contact 53 in the bank engaged by wiper 38. The motor magnet 18 of the stepping switch is operated step-by-step fashion as before, advancing the wipers of the switch until wiper 38 picks up this positive, whereupon relays 16 and 17 operate as before. Relay 15 is then brought into operation and the stepping switch takes three more steps to bring its wipers, including wiper 38, into engagement with the home position contacts 20.

Operation of relay 11 at spring 11E and its make contact closes the register circuit as before and each operation of relay 15 at springs 15D closes the circuit of the total register TA as before. At spring C2G and its make contact, relay C2 prepares a circuit to the register R2A so that each operation of the relay 15 at spring 15C closes a circuit to this register. Thus registers TA and R2A will each be operated three steps, after which the equipment will be restored to normal.

Registering a nineteen time unit assignment to be performed today

Assuming that classification N requires nineteen time units and that it is desired to register such a classification in today's register, key A will be operated as before to operate relay 11; key KN will be operated to operate relay CN, which at spring CNE places positive on conductor 54 that is connected to the last vertical bus in the plug board; and since it is assumed that this classification requires nineteen time units, a plug PN will connect the last vertical bus to the last horizontal bus which is connected by conductor 55 to the first contact 56 in the bank that is engaged by wiper 38. The motor magnet operates as before. Wiper 38 moves into engagement with contact 56 to close circuit for relay 17 which operates to stop further automatic travel of the stepping switch.

Relay CN at spring CNG prepares a circuit to the magnet of register RNA, that circuit being closed by the energization of relay 15 as before. Energization of relay 15 also closes the circuit to total register TA as before. Motor magnet 18 and relay 15 are alternately energized and deenergized as before, operating the step switch step-by-step through nineteen steps until its wipers engage their respective home position contacts 20. Each energization of the relay 15 closes a circuit for the motor magnet of the register TA and also for the motor magnet for register RNA. Thus at the end of the operation, nineteen units will be added to register TA and nineteen units will be registered upon the register RNA. At the completion of this registration the equipment restores to normal as before.

From the foregoing it will be apparent that by operating one of the day keys A to D inclusive, and one of the classification keys K, registrations can be effected in a total register for each day and simultaneously in a classification register for each class for each day.

Registering time units on day registers and number of work assignments on classification registers corresponding to that day

In certain instances it may be advantageous to register one unit for each work assignment in each classification, regardless of the number of time units that that particular work assignment requires. To this end, I have provided plug connections 57 and 58 which, when connected together by a suitable strap, plug, or switch, shunt out springs 15C, 15E, 15G and 15I and their respective make contacts. Under these circumstances, as soon as an energization of relay 17 places positive on conductor 49, a circuit will be completed to the selected classification register for the selected day. Thus, for example, if relay 11 is operated, this positive on conductor 49 will be extended through spring 11E and its make contact, through plugs 57 and 58, to the register bus 59, and thence through the G spring of the classification relay to the register corresponding to that classification. The register is operated over this circuit to register one unit, and the magnet of the register remains energized until the apparatus restores to normal. Subsequent stepping of the motor magnet through an alternate operation of the relay 15 will register in the corresponding total register, such as TA for example, a number of time units corresponding to the selected work classification. Through this arrangement, then, the day register accumulates the total number of time units assigned to that day and the classification registers associated with that day register the number of work orders in each classification regardless of the number of time units those work orders require.

With the equipment in the position shown in the drawings, today's registrations controlled by key A operate relay 11 thereby to register today's assignments on the total register TA and the classification register for the day corresponding to the operated classification key. Assuming that this is Monday, it then follows that tomorrow's registration for Tuesday will be controlled by an operation of key B which operates relay 12 which through spring 12E extends the register circuit to the B group of registers.

On Tuesday morning the day change switch DCS will be changed from its first position to its second position. The registrations on registers in the A group will be wiped out to restore those registers to normal since Monday has already passed. An operation of key A will now close a circuit to relay 12 so that assignments made on Tuesday to be performed on Tuesday will be registered in the registers in group B, which registers on Monday registered assignments to be performed tomorrow. Similarly the other register keys become associated with the next higher numbered relay by movement of the day change switch to its second position and key D, which is operated to register assignments to be performed the day after

the day after tomorrow, becomes associated with relay 11 so that such day after day after tomorrow assignments are registered in the A group of registers.

Correction switch

In the foregoing description it is presumed that the day selection will be made prior to the classification selection. While this is the preferred order of selection, the classification selection may be made first if desired. Should a work order fall in a class requiring a large number of time units, the operator noting that the time units previously assigned to a particular day may want to change the day to which the assignment is to be made.

It will be noted that the day relays 11–14, inclusive, and the classification relays C1–CN, inclusive, when operated, are held in operated position through their respective A springs over conductor 38 which receives positive from conductor 30 through correction switch CS. An operation of switch CS opens this holding circuit permitting the relays to restore. With one day relay operated or one classification relay operated, corrections can be made without difficulty. As soon as a day relay and a classification relay are both operated, the stepping switch begins to function and corrections should not be attempted. Notwithstanding that directions for operating forbid attempting a correction after a day key and a classification key have both been operated, an operator may attempt to make such a correction.

Restoration of a day relay disengages the D spring of the relay from its make contact and restoration of a class relay disengages the F spring of the relay from its make contact. In either case, positive is thus removed from conductor 41 and the stepping switch becomes tied up out of its home position. To guard against a contingency of this kind, positive placed on conductor 39 through conductor 43 and wiper 42, which is away from its home position contact 20, is extended through the chain of D springs on the day relays and their respective break contacts, to conductor 60 that leads to a third wiper 44 on the stepping switch. The contacts engaged by wiper 44, with the exception of the home position contact 20, are multiplied together and connected to conductor 41 through conductor 45. Positive is thus maintained on conductor 41 and the stepping switch operated to step its wipers to home position contacts 20 automatically if relay 17 is in its normal position or through relay 15 if relay is operated. The switch comes to rest in home position in the usual manner.

From the foregoing, it will be apparent that the apparatus of the present invention permits registration of assignments to any one of several days, depending upon the number of day keys with which the equipment is provided, and also to register those assignments in any one of a plurality of classifications depending upon the number of classification keys and registers provided. The number of time units consumed in each classification can be determined by the proper plugging of the plug board thereby to permit registering from one to nineteen time units for each assignment, nineteen being the maximum capacity of the equipment shown. The apparatus is simple and effective to rapidly make the desired registrations and is flexible enough to cope with all situations likely to be encountered.

In the apparatus shown by way of example, four (4) day keys are used and the plug board has a maximum capacity of nineteen time units. It will be readily apparent to one skilled in the art that a different number of days and a different number of time units can be provided for if desired.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. Apparatus of the class described, comprising: a group of total registers; a group of class registers associated with each total register; a group of keys one for each total register, for effecting a selection of one of said total registers; operation of one of said keys rendering ineffective an operation of the remainder of the keys in the group; a group of class keys one for each class register, for selecting a class register in the group associated with the selected total register, operation of one of said class keys rendering ineffective an operation of the remainder of those keys; a relay for each total register key; a relay for each class register key, which relays are operated by an operation of the associated keys, contacts on said relays closed by an operation thereof to prepare circuits to the selected total and class registers respectively; a stepping switch having a magnet, a circuit for said magnet closed through contacts on an operated total and an operated class relay to initiate an operation of the switch; a bank of contacts in said stepping switch; means including contacts on an operated class relay for placing a potential on a predetermined contact in that bank thereby to determine the number of times the selected total and class registers will be operated; a wiper in said stepping switch stepped over said bank of contacts as the switch operates; a stop relay connected to said wiper; a circuit for said stop relay closed by the engagement of said wiper with said predetermined contact thereby to operate said stop relay and open the circuit over which the switch has been operated.

2. Apparatus as specified in claim 1, in which operation of the stop relay closes a circuit to a stepping relay that operates thereover to close circuits to the selected registers and to the stepping switch magnet to operate the same.

3. Apparatus as specified in claim 2, in which operation of the stepping switch magnet over the circuit closed by the stepping relay opens the circuit of the stepping relay which restores, thereby to restore the registers to normal and to open the circuit of stepping switch magnet which restores to advance the switch wiper one step.

4. Apparatus as specified in claim 3, in which the stepping switch has a home position and in which the stepping relay and switch magnet operate alternately to step the wiper of the switch from the contact on which potential has been placed to the home position, with the registers being operated once each time the stepping relay is operated.

5. Apparatus as specified in claim 4, in which the stepping relay has a pair of contacts closed on each operation of the relay to close the circuit to the selected total register and a pair of contacts closed on each operation of the relay to close the circuit to the selected class register thereby to operate those registers.

6. Apparatus as specified in claim 5, in which means are provided for bridging around the pair of contacts on the stepping relay through which the circuit to class register is closed thereby to operate that register but once while the total register is being operated a plurality of times as the switch steps the wipers to the home position.

7. Apparatus for simultaneously registering assignments in a selected one of a plurality of groups and in a selected one of a plurality of subdivisions of that group, comprising: a key for each group, a relay associated with each of said keys, a circuit for each relay closed through the associated key in operated position to operate the relay; a plurality of keys corresponding in number to the number of subdivisions in the group, a plurality of relays one for each one of said plurality of keys, a circuit for each of said plurality of relays closed through the associated key in operated position to operate the relay associated with the operated key; a register for each group; a plu-

rality of subdivision registers associated with each group register; a circuit for each group register prepared by the operation of the group relay to select that register; a circuit for each group of subdivision registers prepared by the operated subdivision relay to select a corresponding register in the subdivision group associated with the selected group register; a stepping switch having a wiper and a bank of contacts engaged thereby, said bank including a home position contact with which said wiper is normally engaged; contact means on said operated subdivision relay for placing potential on a predetermined contact in said bank; a magnet for said switch; a circuit for said magnet closed by the operation of said group and subdivision relays, said circuit including normally closed contacts opened by an operation of the magnet thereby to advance said wiper step-by-step over said bank of contacts; a stop relay; a circuit for said stop relay closed to potential on said predetermined contact by engagement of said wiper therewith to operate that relay; contacts on said stop relay included in said magnet circuit for opening that circuit when the stop relay is operated; a stepping relay; a circuit for said stepping relay extending through said normally closed contacts on said magnet and closed by said stop relay in operated position to operate the stepping relay; contacts on said stepping relay for closing a circuit to said magnet to operate the magnet thereby to open the circuit of the stepping relay, said stepping relay and magnet operating alternately to step said wiper to said home position contact; and contacts on said stepping relay closed by an operation thereof to close the circuits of said selected group and subdivision registers thereby to operate those registers once for each operation of the stepping relay thereby to register the assignment.

References Cited in the file of this patent

UNITED STATES PATENTS

2,179,698	Levy	Nov. 14, 1939
2,207,715	Bumstead	July 16, 1940
2,479,681	Handley	Aug. 23, 1949
2,563,041	Johnston	Aug. 7, 1951
2,605,967	Stone	Aug. 5, 1952

A628

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 1

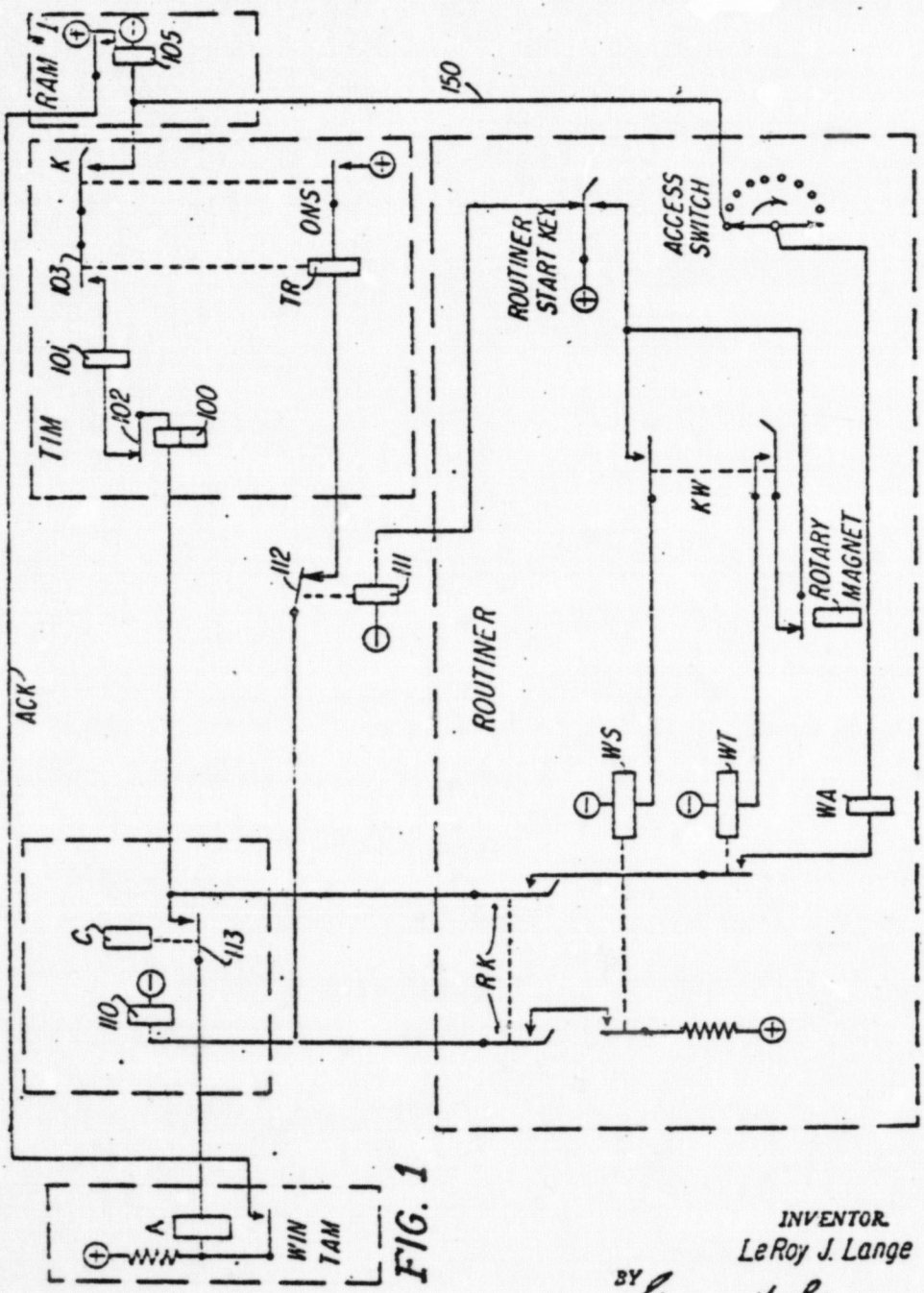


FIG. 1

INVENTOR.
LeRoy J. Lange
BY George H. Simmons
Atty

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 2

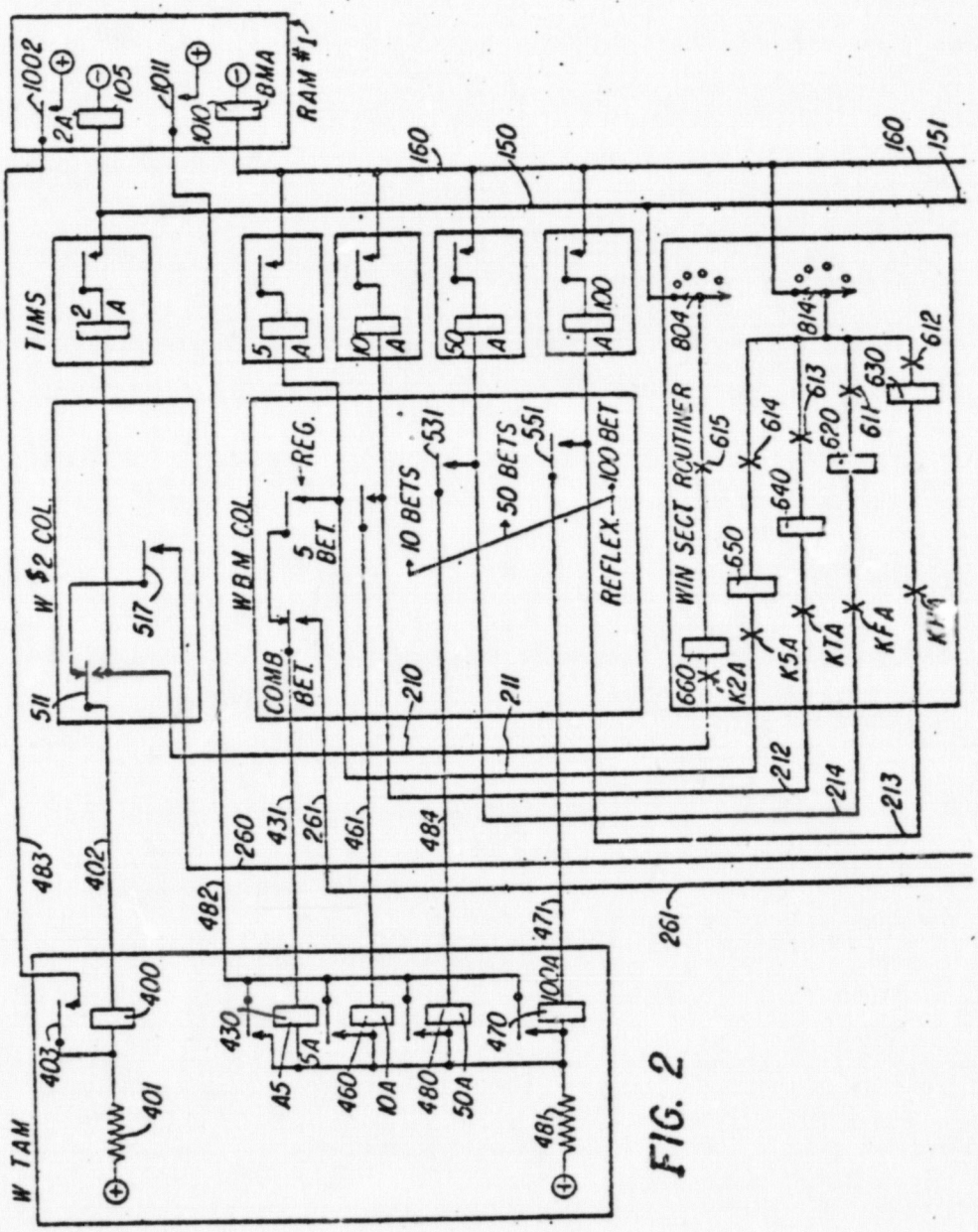


FIG. 2

A630

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 3

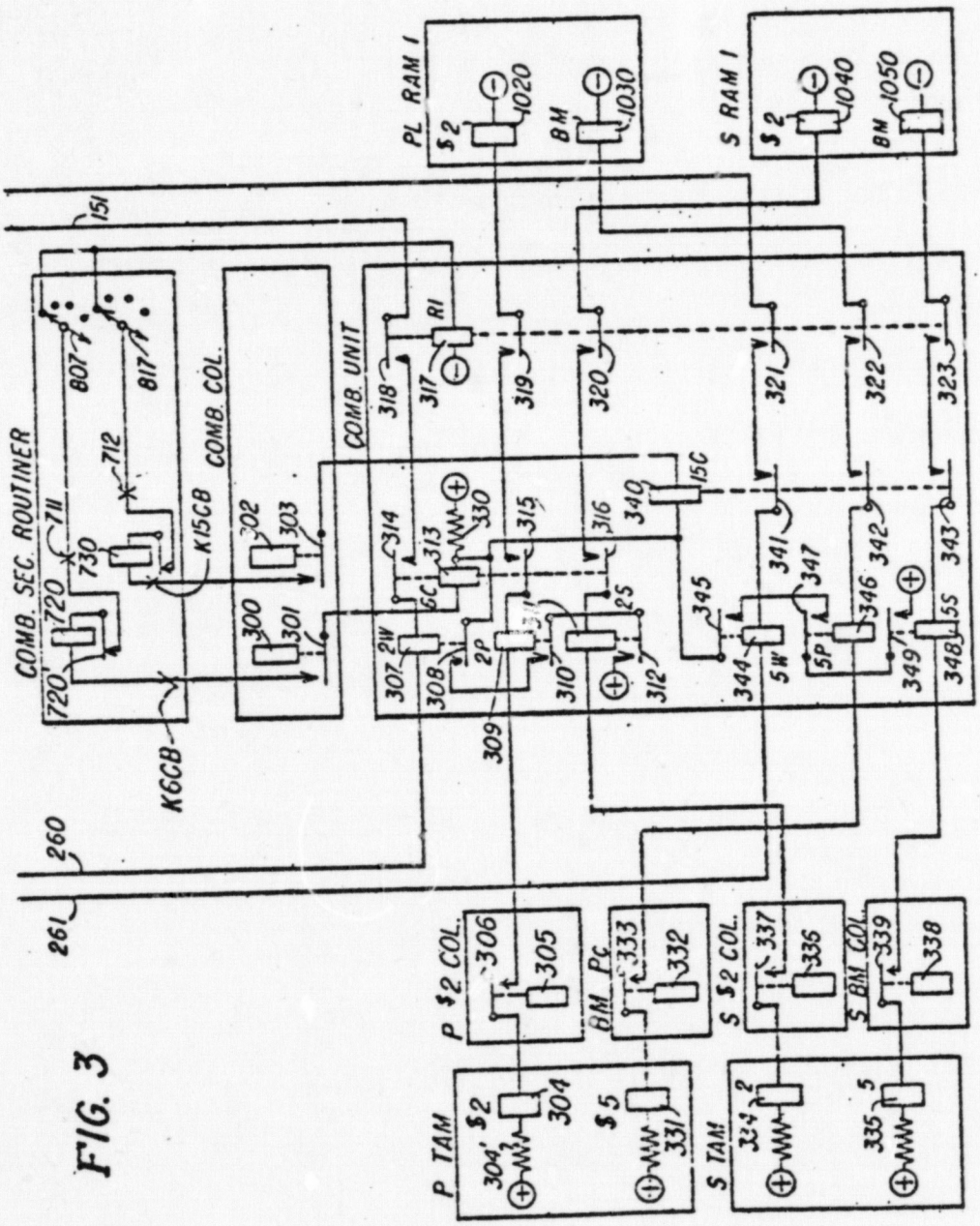


FIG. 3

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 4

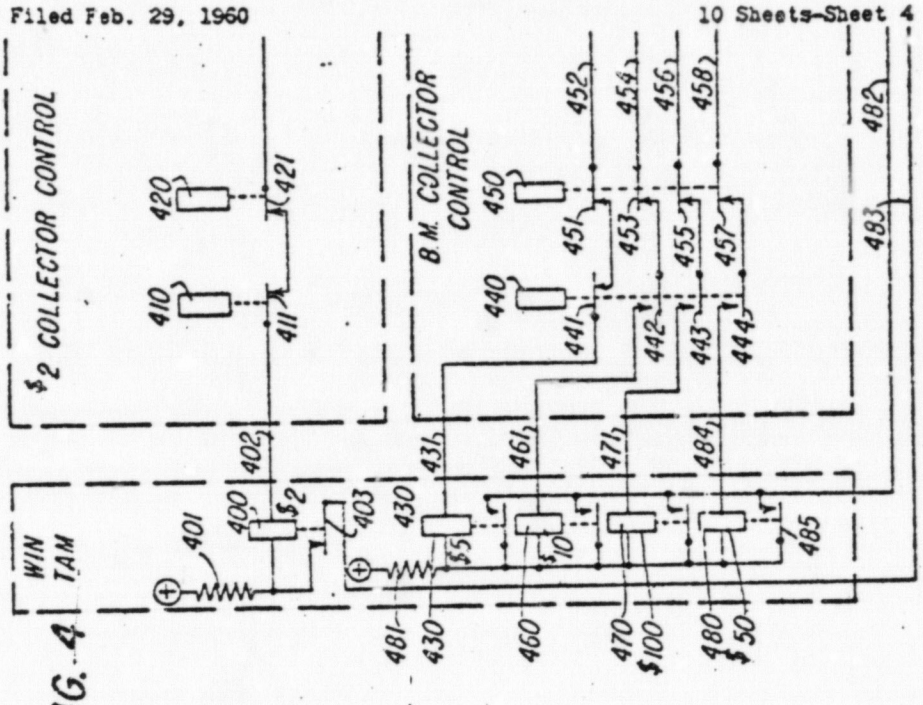


FIG. 4

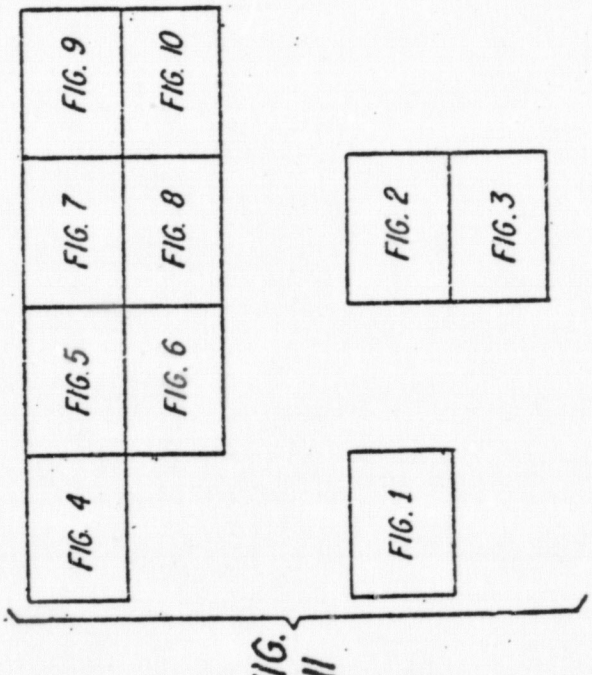


FIG. 11

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 5

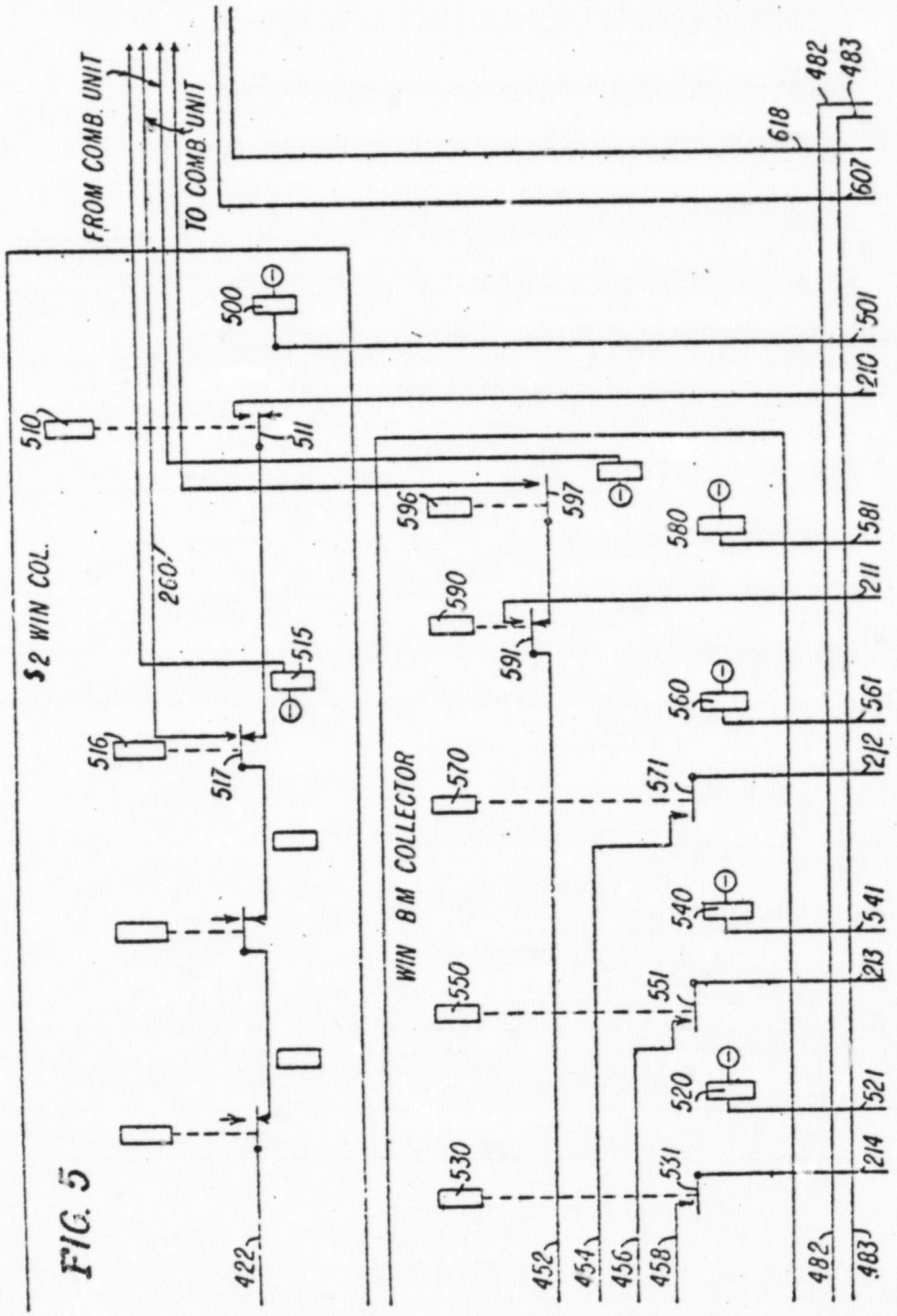


FIG. 5

A632

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 6

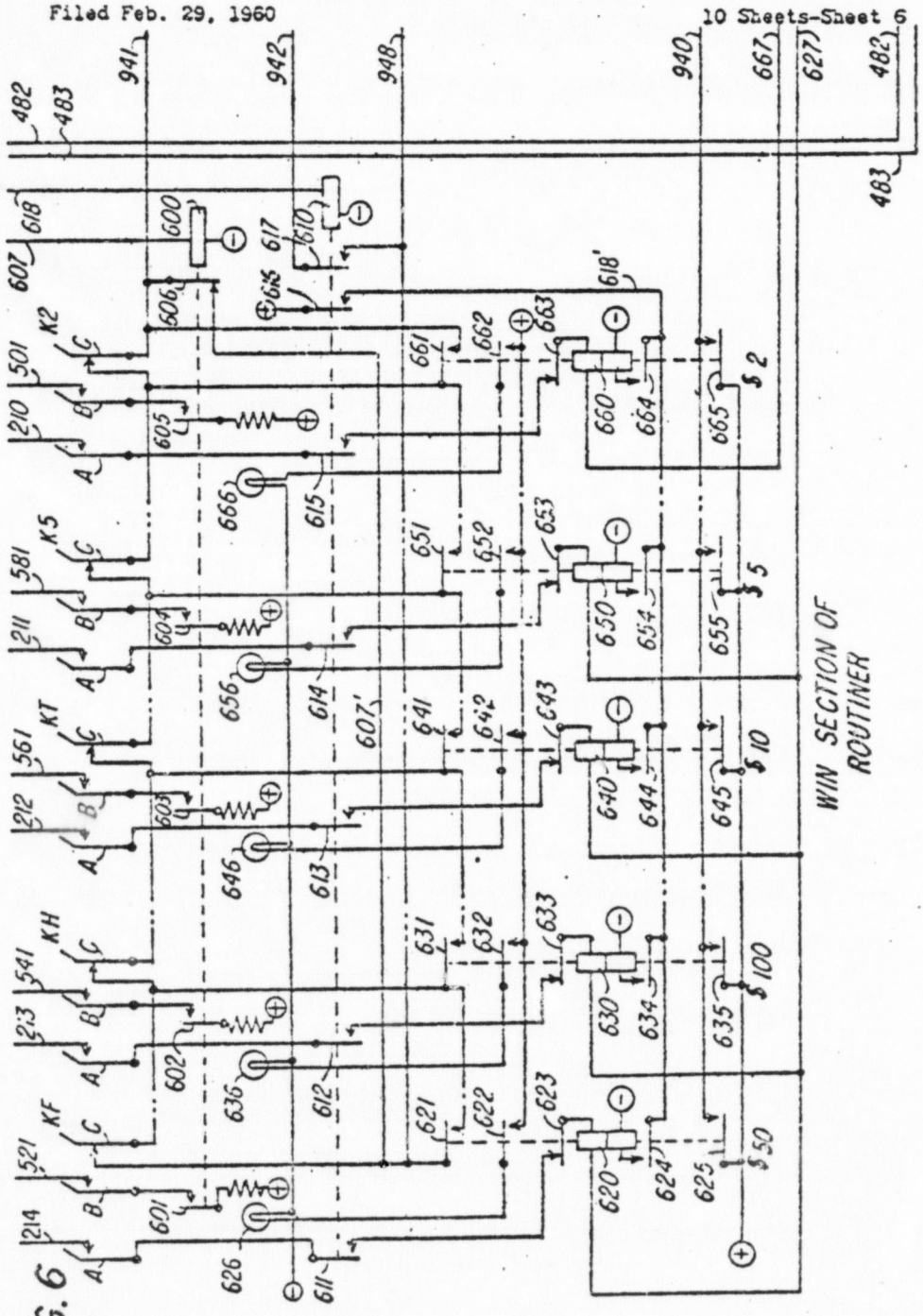
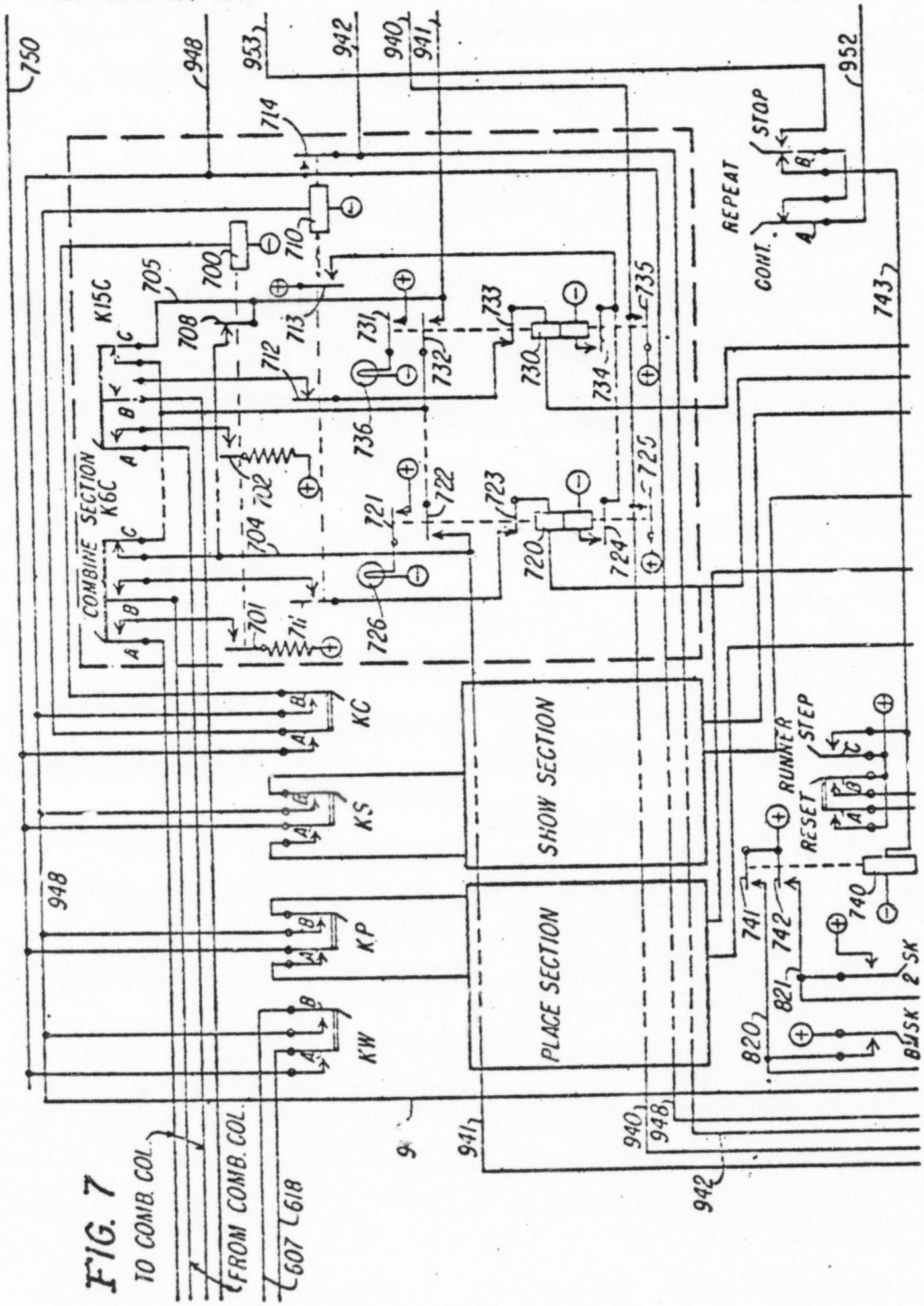


FIG. 6

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 7



A634

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 8

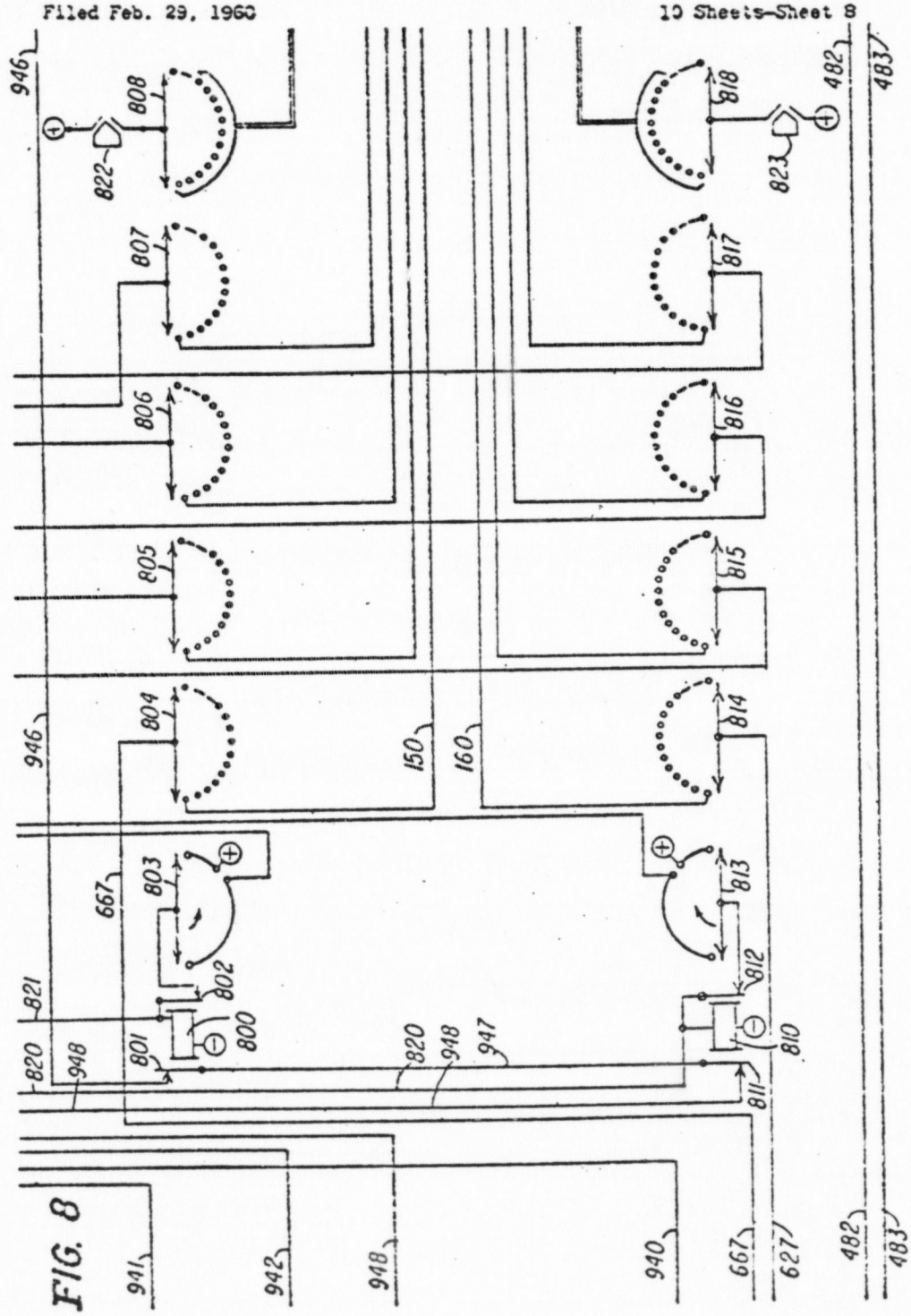


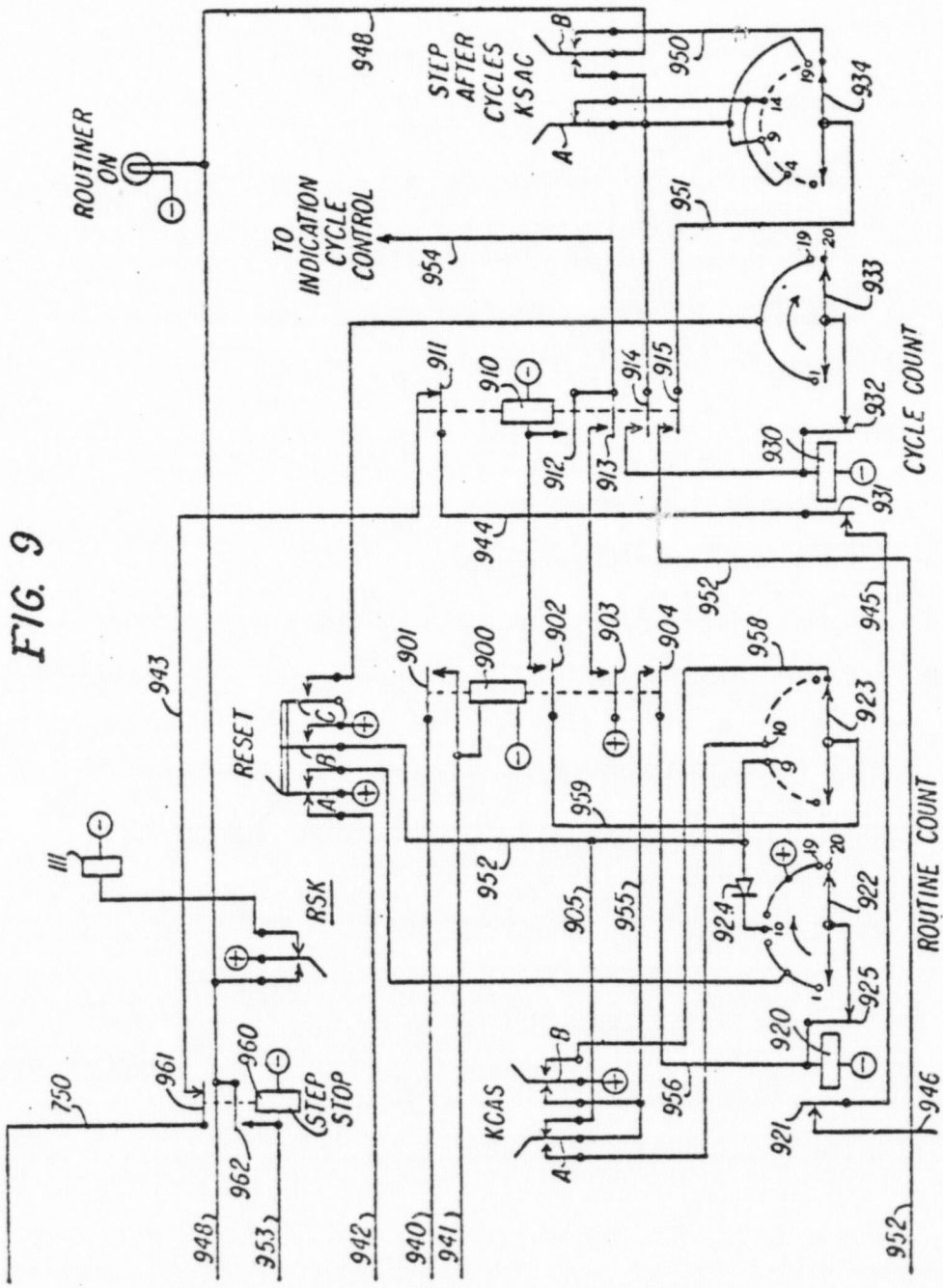
FIG. 8

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 9

FIG. 9



A636

March 27, 1962 LE ROY J. LANGE 3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Filed Feb. 29, 1960 10 Sheets-Sheet 10

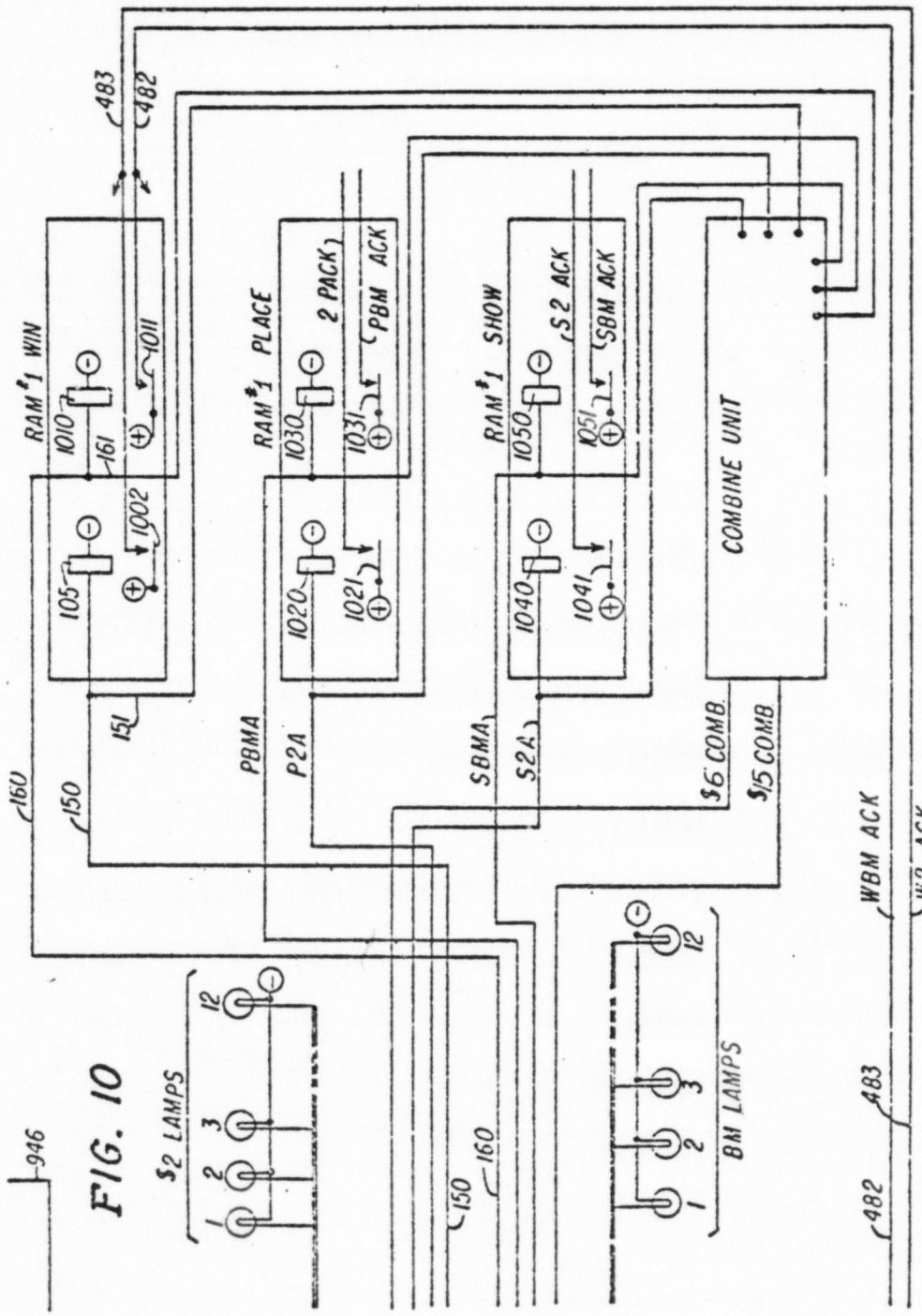


FIG. 10

United States Patent Office

3,027,512
Patented Mar. 27, 1962

3,027,512

ROUTINER FOR TOTALISATOR SYSTEMS

Le Roy J. Lange, Towson, Md., assignor to American Totalisator Company, Division of Universal Controls, Inc., Towson, Md., a corporation of Maryland

Filed Feb. 29, 1960, Ser. No. 11,696
14 Claims. (Cl. 324—73)

This invention relates to a routiner for routine testing of totalisator systems and has for its principal object the provision of a new and improved routiner of this kind.

It is a main object of the invention to provide a routiner for testing the adding machines, combine units, and collectors of a totalisator system under conditions that duplicate the conditions encountered by such devices in the normal operation of the system.

Another object of the invention is to provide a routiner that can be preset to insert a predetermined set of bets of predetermined value into each of the three pools of a totalisator system and to repeat the inserting of this set of bets therein a number of times that can be varied over wide limits.

Another object of the invention is to provide in a routiner, controls by which the individual runner adding machines in the pools of the totalisator system are operated one at a time in sequence, and in which the change from one machine to the next is effected only after a preselected number of operations of the previously operated adding machine have been completed.

Another object of the invention is to provide a routiner that is arranged to insert bets simultaneously in each channel of a totalisator system that has two or more channels and also simultaneously in each of the three pools of the system, and is further arranged to step to the next preselected operation only after a predetermined total number of bets have been inserted in the system by the routiner.

Another object of the invention is to provide a routiner that can be arranged to repeatedly insert a set of bets in a selected pool and only in a selected runner adding machine in that pool, which bets can be inserted over one or more of the channels leading into that adding machine.

Another object of the invention is to provide a routiner that is of simple design that can be manufactured and maintained at low cost without sacrificing quality.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

FIG. 1 is a simplified circuit schematic showing the bypassing of the ticket machines by the routiner;

FIG. 2 is a schematic circuit diagram of the win section of the routiner and associated equipment showing the betting and acknowledging circuits with the control circuits omitted;

FIG. 3 is a diagram similar to FIG. 2, showing the combine section of the routiner and associated equipment;

FIG. 4 is a simplified schematic of the win pool TAM and the control sections of the $2.00 and BM collectors of the pool;

FIG. 5 is a schematic of the remainder of the collectors shown in FIG. 4;

FIG. 6 is a schematic of the win section of the routiner;

FIG. 7 is a schematic of the combine section, a block diagram of the place and show sections of the routiner, and part of the control keys thereof;

FIG. 8 is a schematic of the runner access switches of the routiner;

FIG. 9 is a schematic of the routine count and the cycle count switches and the remainder of the control keys and equipment of the routiner;

FIG. 10 is a diagrammatic illustration of the RAM's in the win, place and show pools and the combine unit of routiner; and

FIG. 11 is a diagram illustrating the manner in which the various figures of the drawing are to be connected together.

The routiner of the present invention is designed for use in a totalisator system having a win pool, a place pool, and a show pool, and a combine unit through the operation of which registrations are made in either the three pools or the win and place pools only in response to the operation of a single ticket issuing machine. In such a system each of the pools contains a total adding machine or TAM, a collector through the operation of which the total adding machine is connected to a group of ticket issuing machines or TIM's one at a time in sequence when all TIM's contain operated keys, the circuit being extended through the TIM to one of a plurality of runner adding machines or RAM's selected by the depressing of a corresponding key in the TIM. TIM's having no operated keys are skipped by the collectors, and in case only one TIM contains an operated key it is connected to the TAM immediately.

Totalisator systems of this kind frequently employ more than one channel over which bets may be registered, and the routiner of the present invention is designed for use in a multi-channel system. Specifically the invention is shown by way of example in connection with the two-channel totalisator system shown in my co-pending application, Serial No. 845,395, filed October 9, 1959, although its teachings are not limited to this particular system.

In the system of this co-pending application there are two channels, the first or $2.00 channel handling the registration of $2.00 bets, and the second or so-called "big money" channel handling the registration of $5.00, $10.00, $50.00 and $100.00 bets. Each channel is equipped with a collector and the system is arranged to effect registrations simultaneously over the two channels.

The routiner of the present invention is provided with a plurality of sections, one for effecting the testing of the adding machines in the win pool, a second section for effecting the testing of adding machines in the place pool, a third section for effecting the testing of adding machines in the show pool, and a fourth section for effecting the testing of the combine unit which is arranged to register bets in all three of the pools and over both channels leading thereto, or in but two of those pools when desired.

In order to duplicate operating conditions as encountered by the totalisator system in its normal use, each section of the routiner is equipped to simultaneously prepare circuits for the insertion of a plurality of bets. The collecters of the respective pools pick up the routine equipments in the corresponding section in predetermined order over each of the two channels to operate the adding machines over the two channels simultaneously, thereby duplicating conditions encountered in normal service.

Each section of the routiner is equipped with a plurality of bet inserting equipments each consisting of a key, a bet accepting relay and associated circuits through the operation of which a predetermined value is entered in the adding machines. In one instance each pool section of the routiner was equipped with fourteen bet inserting equipments, four of which were arranged to insert $2.00 bets over the $2.00 channel of the system, three of which were arranged to insert $5.00 bets over the BM channel thereof, three of which were arranged to insert $10.00 bets over the BM channel, two of which were arranged to insert $50.00 bets over this same channel, and one was arranged to insert $100.00 bets over this channel. In addition, the combine section of the routiner is equipped

with four $6.00 combine equipments over which $2.00 bets are inserted in the win, place and show pools, or in the win and place pools only, as desired, and the combine section also included four $15.00 combine equipments over which $5.00 bets are inserted in the win, place and show pools, or in the win and place pools only.

The value of registrations to be effected in the adding machines of the pools are determined by operation of the keys by which the routiner is controlled. After the desired values have been selected, the controls of the routiner are operated to cause the selected values to be inserted in the adding machines in a number of different ways.

If desired, the routiner controls can be set so that one set of bets is inserted in the TAM's and in RAM 1 in each of the pools, at the end of which operation an indication cycle is initiated so as to display the values registered. The routiner can then be set to step to RAM 2 and the same series of bets inserted in the total adding machines of the three pools and the RAM's 2 therein. This process may be continued until each RAM has received this series of bets. The control equipment of the routiner can be adjusted so as to repeat the selected series of bets a predetermined number of times before changing from one RAM to another, at the end of which an indication cycle in initiated to check the accuracy of the registrations thus effected.

While the routiner is equipped to test all three pools and the combine unit simultaneously, the controls thereof include keys by the operation of which bets may be inserted in any one of the pools exclusively, and the controls further include means whereby the series of bets can be repeatedly inserted in the total adding machine and a selected RAM in a selected pool, none of the other RAM's being operated.

As will be seen in the above mentioned copending application, the collectors are arranged so that each start relay and each collector relay therein handles two ticket machines, connections being extended to one thicket machine over the main chain of the collector and connections being extended to the other ticket machine over the reflex chain thereof. The routiner of the present invention acquires access to the adding machines over the same start and collector relays that are used to connect the TAM to the various TIM's. Thus a part of the start and collector relays of the collectors handle three independent circuits with the third or routiner circuit extending over either the main or reflex chains of the collector as required. Obviously with an arrangement of this kind, the test would be interfered with if one of the ticket machines were to have a key in it depressed while the routine was being applied to the pool in which that particular TIM is located. To guard against contingency of this kind, the routiner of the present invention is arranged to disconnect all of the TIM's during the operation of the routiner, this being accomplished through the BLO relays of the system to render the depressing of a key in a TIM ineffective to close the circuit of the associated collector start relay and also to prevent the closing of the betting circuit through the TIM.

Through the use of the routiner of the present invention a number of bets are inserted in each of the adding machines in each of the pools during the servicing of the system prior to each day's activities thereof and the number of bets inserted during this routine test is maintained high enough to insure that the adding machines and collectors are functioning properly.

In the drawings I have shown the routiner in some detail in connection with the win pool of a totalisator system and also in connection with the combine unit thereof. The place and show pools duplicate the equipment of the win pool and are not shown in any detail to avoid an unnecessary complication of the drawings. Nor has the equipment of the win pool been shown in toto; rather I have shown but one of the four $2.00 bet inserting equipments, one of the three $5.00 bet inserting equipments, one of the three $10.00 bet inserting equipments, one of the three $50.00 bet inserting equipments, and the $100.00 equipment. The combine section of the routiner has likewise been simplified by showing but one $6.00 combine equipment and one $15.00 combine equipment, which equipments also insert $4.00 and $10.00 combines when required.

As will be seen in FIG. 1, each TIM includes a runner selecting key K, a TR relay, an acceptance relay 100, and off normal springs ONS which are operated by any one of the keys K of the machine. The collectors include a start relay 110 the circuit of which is closed only when the BLO relay 111 is in operated position. Relay 111 is maintained operated through the routiner start key so long as that key is in its normal position, as it will be except when the routiner is in operation. Thus when the key K is depressed and the off normal switch ONS operated, positive is extended from this switch through the TR relay of the TIM, through spring 112 and its make contact, through the winding of start relay 110 of the collector to negative, operating relays 110 and TR. Thus when the collector relay associated with the relay 110 operates and closes spring 113 against its make contact, a circuit may be traced from positive through resistance and the acceptance relay A of the TAM, spring 113 and its make contact, acceptance relay 100 of the TIM, spring 102 and its break contact, relay 101 of the TIM, through springs 103 closed by the operation of relay TR through the spring of key K and its make contact, through the winding of acceptance relay 105 of the RAM 1 to negative.

Relays A and 105 operate over this circuit but relay 100 does not immediately. Operation of relay 105 is shown to close a circuit from positive over the conductor ACK and through make contact on the A relay to the junction of the A relay and a resistance, thereby short-circuiting that resistance to increase the current flowing into that circuit sufficiently to cause relay 100 to operate. Operation of relay 100 initiates an operation of the TIM to print and issue the ticket and at springs 102 opens the above traced circuit.

As will be seen in the above mentioned co-pending application, the acknowledging circuit is closed through contacts on a slave relay and a register switch associated with the acceptance relays in the TAM and RAM's. In order to avoid an unnecessary complication of the drawings herein, this circuit is shown as closed by the acceptance relays themselves since it is the operation of the acceptance relays that initiates operations which result in the closing of the acknowledging circuit.

When the routiner start key is operated to start an operation of the routiner, the circuit of relay 111 will be opened and even though the key K of the TIM be depressed neither the relay 110 of the collector nor the relay TR of the TIM will be operated since the circuit thereof will be opened at springs 112. The betting circuit will not be completed since it is maintained open at springs 103 notwithstanding that the key K may be depressed. Through this arrangement interference with a routiner test by the operation of a key in the TIM is definitely prevented.

Prior to operating the routiner start key to initiate a routiner operation, the bet inserting equipment key such as RK, and pool selecting key such as KW, are operated. As a result when the routiner start key is operated, the start relay WS and the bet inserting relay WT are operated over the obvious circuit. Operation of WS closes the obvious circuit for start relay 110 of the associated collector, and when the associated C relay thereof operates and closes spring 113, the circuit is closed from positive through the resistance, and the A relay of the win TAM, through the normally open contacts on the key RK and the relay WT which are now closed, through the acceptance relay WA of the routiner equipment, through the access switch thereof and the acceptance re-

lay 105 of the RAM 1 to negative. Relays 105 and A operate as before, but the routiner relay WA does not operate until the acknowledging circuit is completed and the current flowing through this relay increased to operating value. Thus it will be seen that the bet inserting equipment of the routiner is substituted for the TIM and the access switch of the routiner is substituted for the key such as K in the TIM.

FIGS. 2 and 3 show an amplification of the betting and acknowledging circuits shown in FIG. 1, with the control circuits omitted and by showing in the collectors only the contacts by which circuits are extended through the collector. Only the betting and acknowledging circuits of the win pool are shown in these figures.

As shown, the $2.00 acceptance relay 400 of the win pool TAM is normally connected by the $2.00 collector of the pool in a circuit that extends through the acceptance relay of a $2.00 TIM and thence to the $2.00 acceptance relay 105 of RAM 1 when the key 1, not shown, of the TIM is depressed. When the acceptance relays of the adding machines are operated, an acknowledging circuit is extended to thereby increase the current flowing through the acceptance relay of the TIM to operate that relay and thereby cause the TIM to print and issue the ticket. The TAM $5.00 acceptance relay 430, the $10.00 relay 460, the $50.00 relay 480, and the $100.00 relay 470 are connected one at a time, using regular and reflex circuits, by the big money collector to a corresponding value ticket machine and the circuit extended therethrough to the common big money acceptance relay 1010 of the RAM 1, and when the adding machine relays are operated the acknowledging circuit is closed to increase the current flowing through the acceptance relay of the connected TIM to operate that relay and thereby cause the TIM to print and issue the ticket.

The win section of the routiner contains a $2.00 acceptance relay 660 which is connected to relay 400, through spring 511 of the associated collector relay in the $2.00 collector when that relay's turn is reached and it is operated, thereby to extend a circuit from positive through the resistance 401, relay 400 of the TAM, conductor 402, through spring 511 and its make contact, conductor 210, through the relay 660 of the routiner, through the wiper 804 of the runner access switch of the routiner, conductor 150, through the acceptance relay 105 of the RAM 1 to negative. Relays 400 and 105 operate over this circuit. The acknowledging circuit is completed through springs 1002, conductor 483, spring 403 and its make contact, short-circuiting resistance 401 to increase the current flowing through relay 660 to cause that relay to operate. Thus it will be seen that the routiner by-passes the TIM and substitutes an acceptance relay such as 660 for the acceptance relay of the TIM.

In a similar manner, the $5.00 acceptance relay 650, the $10.00 acceptance relay 640, the $50.00 acceptance relay 620, and the $100.00 acceptance relay 630 of the win section of the routiner are connected to the respective acceptance relays of the TAM through the BM collector springs and the circuit is extended through the wiper 814 of the big money runner access switch to conductor 160 which leads to the big money acceptance relay 1010 of the RAM 1. Through this arrangement a predetermined set of values are registered in the TAM and selected RAM of the pool in a manner hereinafter described.

As will be seen in FIG. 3, the combine section of the routiner includes a $6.00 combine acceptance relay 720 which is connected through the combine collector to the $6.00 combine acceptance relay 313 of the combine unit of the system, and when the relay 300 of the combine collector operates, a circuit is extended from positive through a resistance 330, relay 313, spring 301 and its make contact, through the relay 720, through spring 720' and its break contact, through the wiper 807 of the runner access switch of the routiner to the runner 1 selecting relay 317 of the combine unit to negative, relays 313 and 317 operating over this circuit. Operation of these combine unit relays extends a circuit from the $2.00 acceptance relay 400 of the TAM over conductor 402, spring 511 and its break contact, spring 517 and its make contact, conductor 260, through the relay 307, springs 314 and 318 and their respective make contacts, conductor 151, which connects with conductor 150 to extend the circuit through the acceptance relay 105 of RAM 1. Relays 400 and 105 operate over this circuit and the acknowledging circuit is completed as before to increase the current flowing through relay 307 sufficiently to cause that relay to operate.

Operation of relays 313 and 317 also prepares circuits for the place TAM and runner 1 RAM in the place pool, which circuit is completed when the place $2.00 collector relay 305 operates to close springs 306, thereby completing a circuit from positive through resistance 304', relay 304, relay 309, spring 315 and its make contact, spring 319 and its make contact, relay 1020 to negative, operating relays 304 and 1020, which close the acknowledging circuit of the pool, not shown, to increase the current flowing through relay 309, causing that relay to operate.

Operation of relays 313 and 317 also prepare a circuit for the $2.00 acceptance relay 334 of the show TAM relay 311, acceptance relay 1040 of the RAM 1 in the show pool, which circuit is completed when the $2.00 collector relay 336 of the show pool operates. Relays 334 and 1040 operate and close the pool acknowledging circuit, not shown, which increases the current flowing through relay 311, thereby causing that relay to operate. Relays 307, 309 and 311 thus being operated, an acknowledging circuit is closed from positive through spring 312 and its make contact, spring 310 and its make contact, spring 308 and its make contact, to the junction of relay 313 and the resistance 380, which acknowledging circuit short-circuits the resistance 330, thereby increasing the current flowing through relay 720 sufficiently to cause that relay to operate. Upon operating, relay 720 opens its own circuit and the circuit of relays 313 and 319 by opening springs 720'.

In a similar manner, the $15.00 combine acceptance relay 730 of the combine section of the routiner operates in series with relays 340 and 317 to insert bets over the big money channels in the win, place and show pools to register $5.00 in the TAM and runner 1 adding machines of each of these pools and upon operating opens the circuit through these relays by opening springs 730'.

Oftentimes totalisator systems are arranged to issue $4.00 and $10.00 combine tickets in addition to $6.00 and $15.00 tickets. In such instances the combine section will either have a 4c relay which corresponds to the 6c relay 720, and a 10c relay which corresponds to the 15c relay 730, or relays 720 and 730 will be included in circuit with relays similar to relays 313 and 340, respectively, which latter relays close circuits to only the win and place pools instead of to the three pools as shown. In the combine unit, the acknowledging circuit over which resistance 330 is short-circuited will be closed when two acceptance relays, corresponding to 308 and 309, are operated.

Inserting a Series of Bets in the Win Pool and Upon Runner 1 Therein

To effect the above, the keys KF, KH, KT, K5 and K2 in the win section of the routiner, FIG. 6, are operated to move their respective A, B and C springs from normal to operated position. Since it is desired to insert bets in the win section, the key KW, FIG. 7, is also operated to move its springs A and B into engagement with their respective make contacts. Since it is assumed that the bets to be inserted are on runner 1 in the win pool, runner step key, FIG. 7, is operated to close its spring C against its make contact thereby to complete a circuit from positive through the winding of the runner

BEST COPY AVAILABLE

step relay 740 to negative. Relay 740 at spring 741 extends a circuit from positive over conductor 820, through the winding of the magnet 810 of the big money access switch, to negative, operating that magnet preparatory to advancing the wipers thereof from their twentieth to their first bank contacts. At spring 742, relay 740 closes a circuit from positive over conductor 321, through the winding of the motor magnet 800 of the $2.00 runner access switch, to negative, operating that magnet preparatory to advancing its wipers from their respective twentieth to their first bank contacts. The runner step key is then released, the magnets restore, and the wipers are advanced.

Since the access switches are located so as not to be readily seen from the control panel, the operator may check the position of these switches by depressing push buttons 822 and 823. Operation of push button 822 closes a circuit from positive, through the wiper 808 of the $2.00 access switch, through the number 1 lamp in the $2.00 lamp group to negative, lighting that lamp to indicate that RAM 1 has been selected by that switch. Operation of push button 823 closes a similar circuit from positive through wiper 818 of the big money access switch to the lamp 1 in the big money lamp group to negative, lighting that lamp to indicate that this switch is set to select RAM 1.

The routiner thus being set to insert a set of bets in the win pool TAM and RAM 1 therein, the operator may then move start key RSK, FIG. 9, from its normal to its operated position to start the operation of the routiner. Key RSK locks in operated position. This operation of the key RSK opens the circuit of BLO relay 111, thereby disconnecting the TIM's, and applies positive to conductor 948, lighting the routiner on lamp to indicate that the routiner has been started. Positive on conductor 948 closes a circuit for the start relay 600 of the win section of the pool, which may be traced from this positive, make contact of and spring B of the key KW, conductor 607, through the winding of relay 600 to negative. Relay 600 operates over this circuit and closes a circuit from positive through a resistance, spring 601 and its make contact, the B spring of the key KF and its make contact, conductor 521, through the winding of the $50.00 start relay 520 of the BM collector to negative, operating relay 520. At spring 602, a similar circuit is closed for the $100.00 start relay 540 of the collector. At spring 603, a similar circuit is closed to the $10.00 start relay 560 of the collector. At spring 604, a similar circuit is closed to the $5.00 start relay 580 of the collector, operating those relays. At spring 605, relay 600 closes a circuit from positive through a resistance, spring 605 and its make contact, the B spring of key K2 and its make contact, conductor 501, through the winding of the start relay 500 in the $2.00 collector of the win pool, operating that relay. At spring 606, relay 600 opens a normally closed link over conductor 607', connecting conductor 948 to conductor 941 without effect at the moment.

Positive placed upon conductor 948 by the routiner start key RSK extends a circuit which may be traced from positive on this conductor through spring 811 and its break contact, FIG. 8, conductor 947, spring 801 and its break contact, conductor 946, through spring 921 and its break contact, FIG. 9, conductor 945, spring 931 and its break contact, conductor 944, through spring 911 and its break contact, conductor 943, through spring 961 and its break contact, conductor 750, through the make contact of and the A spring of the key KW, FIG. 7, conductor 618, through the winding of the T relay 610 in the win section of the routiner, to negative, operating relay 610.

Operation of the start relays 520, 540, 560 and 580 of the big money collector for the win pool started that collector in operation and when the collector relay 530 associated with the start relay 520 is operated a circuit is closed from positive through resistance 481 and the $50.00 acceptance relay 480 of the win TAM, conductor 484, spring 444 and its make contact of the reflex relay 440, spring 457 and its break contact, conductor 458, spring 551 and its make contact, conductor 214, through the A spring of the key KF and its make contact, through spring 611 and its make contact, through spring 623 and its break contact, through the upper winding of acceptance relay 620 to conductor 627, wiper 814 of the big money runner access switch and the first contact of its bank engaged thereby, conductor 160, through the winding of the big money acceptance relay 1010 of the RAM 1 in the win pool, FIG. 10, to negative. Relays 1010 and 480 operate over this circuit but relay 620 does not receive sufficient current to enable it to operate.

Operation of relay 1010 at springs 1011 places positive on the big money acknowledging conductor 482, spring 455 and its make contact, to the junction of resistance 481 and relay 480, thereby short-circuiting that resistance to increase the current flowing through relay 620 sufficiently to cause that relay to operate. Operation of relay 610 extends positive through spring 616 and its make contact, to conductor 618', and relay 620 at spring 624 completes a holding circuit from this positive through the lower winding of the relay to negative.

Operation of relay 620 moves spring 623 away from its break contact thereby opening the circuit of relay 480 and relay 1010, causing relays 480 and 1010 to restore.

As is explained in the above mentioned co-pending application, the operation of an acceptance relay in the TAM such as relay 480, for example, removes positive from the start circuit of the collector, stopping that collector so long as the TAM relay remains operated. Restoration of relay 480 therefore re-applies positive to the start chain of the collector, not shown, and in due course collector relay 550 will be operated. Operation of this relay extends a circuit from positive through resistance 481, through the $100.00 acceptance relay 470 of the win TAM, conductor 471, spring 443 and its make contact, spring 455 and its break contact, conductor 456, spring 551 and its make contact, conductor 213, through the A spring and its make contact of the key KH, through spring 612 and its make contact, through spring 633 and its break contact, through the upper winding of $100.00 acceptance relay 630 of the routiner and thence over the previously traced circuit, over conductor 627 to the relay 1010, to negative. Relays 470 and 1010 operate as before and when the acknowledging circuit is completed, relay 630 operates and moves springs 633 away from its break contact thereby to open its circuit through its upper winding. At spring 634, relay 630 closes a holding circuit from positive on conductor 618', through the lower winding of the relay, to negative.

Relays 470 and 1010 restore as before and in due course collector relay 570 is operated to close the circuit from the $10.00 acceptance relay 460 of the win TIM through the upper winding of relay 640 to conductor 627 and relay 1010 as before. Relays 460 and 1010 operate and upon completion of the acknowledging circuit relay 640 operates to open the circuit through its upper winding. At spring 644 and its make contact, relay 640 extends a holding circuit through its lower winding to positive on conductor 618'.

In a similar manner relay 650 is operated over its upper winding in series with $5.00 acceptance relay 430 of the win TAM and relay 1010, and upon operating opens the circuit through its upper winding at springs 653. At spring 654, relay 650 extends positive on conductor 618' through its lower winding to negative to hold the relay operated.

Thus it will be seen that relays 620, 630, 640 and 650 and other similar relays, not shown, through the operation of which big money bets are inserted in the win pool through the BM collector, are operated in sequence one at a time. It will be noted that a circuit of $5.00 acceptance relay 430 of the win TAM extends through break

contact 441 on the reflex relay 440, rather than through make contacts on this relay as do the circuits of the other acceptance relays 460, 479 and 480. This is because in the examples shown, the $5.00 bets are assumed to be placed over the main chain of the collector, and the $10.00, $50.00 and $100.00 bets placed over the reflex chain thereof, as more fully explained in the above mentioned co-pending application.

Simultaneously with the operations of the start relays of the BM collector of the win pool, start relay 500 of the $2.00 collector of that pool is operated and in due course collector relay 510 associated therewith is operated. Since the $2.00 collector is entirely independent of the BM collector, operation of relay 510 is in no way dependent upon the operations in the BM channel. Operation of relay 510 closes a circuit from positive through resistance 401, $2.00 acceptance relay 400 of the win TAM, conductor 402, spring 411 of the reflex relay 410 and its break contact, spring 421 of the reset relay 420 and its break contact, conductor 422, thence over the chain of break contacts leading to spring 511 and its make contact, conductor 216, through the A spring and its make contact of key K2, through spring 615 and its make contact, through spring 663 and its break contact, through the upper winding of relay 660, conductor 667, through the wiper 804 of $2.00 access switch and the first bank contact engaged thereby, conductor 150, through the winding of $2.00 acceptance relay 105 of RAM 1 in the win pool to negative, operating relay 105 and relay 460. At spring 1002, relay 105 places positive on the $2.00 acknowledging conductor 483 which is extended through spring 403 and its make contact, to apply positive to both ends of resistance 401 to short-circuit that resistance, thereby to increase the current flowing through the upper winding of relay 660 sufficiently to cause that relay to operate and open the circuit through its break spring 663. At spring 664, relay 660 extends a holding circuit through its lower winding to positive on conductor 618'.

Each of the acceptance relays of the win section of the routiner has associated with it a lamp which is operated when the relay operates. Thus lamp 626 associated with relay 620, is operated from positive through spring 622 and its make contact, to indicate the completion of the bet over the circuit through the upper winding of the relay. At spring 632, relay 630 closes a circuit from positive through lamp 636 for a similar purpose, and each of the other acceptance relays closes a circuit to the associated lamp in the same manner.

It will be noted that when the start relay 600 is in normal position, previously traced conductor 948 is extended over conductor 607, through spring 606 and its break contact, to conductor 941, and also when keys KF, KH, KT, K5 and K2 are in their respective normal positions conductor 948 is extended through the C springs of these keys and their respective break contacts to conductor 941.

Since in the routiner the keys and circuits thereof of the place section duplicate those of the win section, and the keys of the show section likewise duplicate the win section, except that conductor 948 is not connected to conductor 941 but rather the normally closed contacts on the start relays of the sections which correspond to relay 600, contacts which correspond to relay 606 merely extend a by-pass circuit around the normally closed C springs on the keys of the section.

Acceptance relays 620 through 660 of the win section of the routiner now being in operated position as above explained, positive on conductor 948 is extended through the chain of contacts including 621, 631, 641, 651 and 661 and their respective make contacts, to conductor 941, which conductor is extended through the place and show sections as above, and extended through the combine section of the routiner over by-pass conductor 704, spring 703 and its break contact, by-pass conductor 705, conductor 941, extending through release relay 900 to negative, operating that relay.

It will also be noted that through the operation of the acceptance relays of the win section of the routiner, and springs 625, 635, 645, 655 and 665 thereof, positive is placed on conductor 940 which extends to springs 901 and its make contact, thereby to close a holding circuit for relay 900 to maintain that relay operated so long as any one of the routiner acceptance relays remain operated.

The operation of the routiner responsive to the operation of relay 900 depends upon which of several operating conditions has been selected.

Inserting the Same Series of Bets in Each of the RAM's in the Win Pool

When it is desired to insert a single set of bets in each of the RAM's of the pool one at a time in sequence, key KCAS, FIG. 9, is operated to close its B spring against its make contact and key KSAC is also operated to close its B spring against its make contact. Under these conditions operation of relay 900 closes a circuit which may be traced from positive on the B spring to key KCAS and its make contact, conductor 958, the twentieth contact in the bank engaged by wiper 923, conductor 959, spring 902 and its make contact, through the winding of cycle relay 910 to negative, operating that relay. At spring 903, relay 900 closes a circuit from positive through spring 913 and its make contact, spring 912 and its make contact, to relay 910, to hold that relay operated so long as relay 900 remains operated. The positive placed on spring 913 through its make contact is extended over conductor 954 to the indication cycle relay of the system, operating that relay to initiate an indication cycle in the manner explained in the above mentioned co-pending application.

Upon operation of relay 910 a circuit is closed from positive on conductor 948 through the B spring of key KSAC and its make contact, conductor 950, through the twentieth bank contact engaged by wiper 934, conductor 951, spring 915 and its make contact, conductor 952, through the A spring of the repeat key and its break contact, FIG. 7, through the B spring of the repeat key and its break contact, conductor 743, through the winding of the runner step relay 740 to negative. Relay 740 operates over this circuit and at springs 741 and 742 closes the previously traced circuits to the magnets 810 and 800 respectively of the access switches, operating those magnets preparatory to advancing their wipers one step.

The previously traced circuit for the T relay 610 in the win section of the routiner is now open at a plurality of points, namely, at spring 811 by the operation of magnet 810, at the spring 801 by the operation of magnet 800, and at spring 911 by the operation of relay 910. Relay 610 restores opening spring 616 from its make contact, thereby removing positive from conductor 618' to which the acceptance relays 620 to 660 were held operated over their respective lower windings. These relays therefore restore.

When all of the acceptance relays have restored, positive is removed from conductor 940 by the opening of the respective fifth contact of each relay, and as a result of the removal of positive from conductor 940 the holding circuit of relay 900 is opened allowing that relay to restore. Restoration of relay 900 at springs 903 opens the holding circuit of relay 910 allowing that relay to restore. At spring 915, restoration of relay 910 opens the circuit of the runner step relay 740 allowing that relay to restore and open the circuit of magnets 800 and 810 which restore to advance the wipers of these switches to their next bank contacts. Restoration of magnets 800 and 810, together with restoration of relay 910, closes the previously traced circuit for the T relay 610 to operate that relay.

The previously traced circuits to the collector and win TAM are again closed; however, since wiper 804 of the $2.00 access switch is now engaged with its second bank

contact, the acceptance relay of the win RAM 2, not shown, will be operated. Wiper 814 of the big money access switch is likewise engaged with its second bank contact, so the big money acceptance relay of the win RAM 2, not shown, which corresponds to relay 1010, will also be operated. The set of bets is thus inserted in the win TAM and RAM 2 therein in the hereinbefore explained manner, and when all of these bets are completed relay 900 is again operated and the previously traced circuits re-operated to step the access switches one more step. This routine is repeated until all of the RAM's in the win pool have been tested.

It will be noted that when wiper 803 of the $2.00 access switch engages its thirteenth bank contact, a circuit will be closed from positive through this wiper, through spring 802 and its break contact, through the winding of magnet 800, to negative, causing that magnet to operate in buzzerlike fashion to advance the wipers of the switch into engagement with their twentieth or home position contacts. A similar circuit for magnet 810 is closed through wiper 813 and its thirteenth bank contact to step the wipers of the BM access switch into engagement with their twentieth or home position contacts.

Upon restoration of the relays 900 and 910 at the completion of the testing of the twelfth RAM in the pool, the circuit of relay 610 is again closed; however, since the wipers of the access switches are now engaged with their respective home position contacts the previously traced circuits to the acceptance relays of the win TAM are not completed. The collector continues to operate and the C relays are operated in turn; however, since the positive is not removed from the collector start chains, the relays of the collector merely chatter.

Repeating a Set of Bets to Each RAM Before Stepping to the Next RAM

Assume for the moment that it is desired to repeat the set of bets inserted in RAM 1 five times before stepping to RAM 2. Under these conditions key KSAC will be moved to engage its B spring with its break contact. Key KCAS is positioned with its B spring engaging its make contact as before.

Under these conditions when relay 900 is operated at the end of the inserting of a set of bets in the pool, the previously traced circuit for relay 910 is closed and that relay operated as before. A circuit may now be traced from positive on conductor 948 through the B spring of key KSAC and its break contact, spring 914 and its make contact, through the winding of magnet 930 of the cycle count switch to negative, operating that magnet. At spring 931, magnet 930 opens a point in the previously traced circuit of relay 610, and when that relay restores and relay 900 restores as before, relay 910 is restored to open the circuit of magnet 930 which restores to advance the wipers of the cycle count switch one step.

The set of bets is then inserted and the RAM 1 operated as before, at the end of which the cycle count switch is again stepped. This continues until the switch has been operated to move its wipers 934 into engagement with its fourth bank contact.

When relay 900 is operated at the completion of the inserting of the fifth set of bets in RAM 1, and the relay 910 operated as before, a circuit may then be traced from positive on conductor 948 through the B spring of key KSAC and its break contact, through the A spring of this key and its break contact, through the fourth bank contact now engaged by wiper 934 and that wiper over the previously traced circuit, to the runner step relay 740 to operate that relay. Operation of relay 740 operates the magnets of the access switches as before, and upon restoration of relays 900 and 910 the access switches are stepped one step as before. Relay 610 is then again operated and the same set of bets inserted in the win TAM and RAM 2 five times, at the end of which cycle the access switches are again operated to step their wipers into engagement with the next contact in their bank.

Repeating a Set of Bets Ten Times Before Stepping to the Next RAM

Under these conditions key KSAC is operated to engage its B spring with its break contact and to open its A spring from its make contact. Under these conditions cycle count switch must take nine steps to bring its wiper 934 into engagement with its ninth bank contact. When the relay 910 is operated at the completion of the inserting of the tenth set of bets in the RAM, a circuit may be traced from positive on conductor 948 through the B spring of key KSAC and its break contact, through the ninth bank contact engaged by wiper 934 and that wiper, thence over the previously traced circuit to the runner step relay 740, operating that relay. As a result of the operation of relay 740, the access switches are stepped ahead one step as before and the same cycle of bets is inserted in the next RAM ten times before the access switches are again stepped.

Multiplying by One

The number of times that a set of bets is inserted in a particular RAM may be multiplied by the joint operation of keys KCAS and KSAC. If for instance key KSAC is operated to close its B spring against its make contact, and key KCAS is positioned with its B spring in engagement with its break contact, when relay 900 is operated at the completion of the inserting of a set of bets, a circuit may be traced from positive through the B spring of key KCAS and its break contact, conductor 955, through spring 904 and its make contact, conductor 956, through the winding of the routine count magnet 920 to negative, operating that magnet preparatory to advancing the wipers of the switch one step. At spring 921, magnet 920 opens the previously traced circuit to relay 610 allowing that relay to restore, and upon restoration of relay 900 the circuit of magnet 920 is opened and that relay restores to advance the wipers of the switch one step. This cycle of operation is repeated until wiper 923 engages its ninth bank contact, and when relay 900 is again operated at the completion of the inserting of the tenth set of bets the circuit may be traced from positive through the B spring of key KCAS and its break contact, through the A spring of this key and its break contact, conductor 905, through the ninth bank contact engaged by wiper 923 and that wiper, conductor 959, spring 902 and its make contact, through the winding of relay 910 to negative. Relay 910 operates over this circuit and the previously traced circuit for magnet 920 is likewise closed and that magnet operated.

Operation of relay 910 closes a circuit which may be traced from positive through the B spring of key KSAC and its make contact, through the twentieth contact engaged by wiper 934, and thence over the previously traced circuit to the runner step relay 740, operating that relay. Thus the ten sets of bets inserted in the RAM through the operation of key KCAS is multiplied by one, and the access switches stepped to the next RAM.

Multiplying by Five

If, however, key KSAC is set with its B spring engaging its break contact when cycle relay 910 operates at the end of the inserting of the tenth set of bets in the RAM, a circuit may be traced from positive on conductor 948, through the B spring of key KSAC and its break contact, spring 914 and its make contact, through the winding of magnet 930 to negative. Upon restoration of relay 910 as before, magnet 930 advances its wipers one step, this operation continuing through the inserting of the set of bets fifty times, at which time wiper 934 will be engaged with its fourth bank contact.

It will be noted that upon restoration of the magnet 920, when the wiper 922 thereof is engaged with its ninth

bank contact as above assumed, the movement of this wiper 922 in engagement with its tenth bank contact completes the circuit previously traced to conductor 905 and thence through the diode 924 to the tenth contact of the bank engaged by wiper 922, thence through that wiper and the spring 925 and its break contact, through magnet 920 to negative, operating that magnet which opens its own circuit at spring 925. Wiper 922 is thus advanced to its eleventh bank contact and positive is maintained on contacts 11 to 19 of this bank, so that the magnet 920 operates in buzzerlike fashion to position the switch wipers on their twentieth or home position contacts.

When relay 910 is again operated at the completion of the inserting of ten more sets of bets in the RAM, that is, upon the completion of the fiftieth set of bets, a circuit may be traced from positive on conductor 948, through the B spring of key KSAC and its break contact, through the A spring of this key and its break contact, through the fourth bank contact engaged by wiper 934, and thence over the previously traced circuit or runner step relay 740 to operate that relay preparatory to advancing the wipers of the access switch to the next RAM. Thus it will be seen that the same set of bets is inserted in the RAM fifty times before the access switches are operated to extend connections to the next RAM.

Multiplying by Ten

By operating key KSAC to disengage its A spring from its break contact and with the key KCAS having its B spring engaged with its break contact, the cycle of ten sets of bets inserted in a RAM will be multiplied by ten since wiper 934 of the cycle count switch must engage its ninth bank contact before the circuit of the runner step relay 740 is closed. Thus when relay 910 operates at the completion of the inserting of the one-hundredth set of bets in the RAM, the access switches are operated to select the next RAM in the pool.

When key KCAS is operated to move its A spring out of engagement with its break contact and into engagement with its make contact, the set of bets will be repeated eleven times on each RAM since wiper 923 of the routine count switch must be engaged with its tenth bank contact before the circuit is closed to relay 910. This routine of eleven sets of bets will be repeated on each RAM once if the key KSAC is operated to engage its B spring with its make contact; will be repeated five times if the B spring of this key is engaged with its break contact; and will be repeated ten times if the A spring of this key is moved out of engagement with its break contact.

Simultaneous Routine of Two Different RAM's in a Pool

It will be noted that through a momentary operation of key BMSK, FIG. 7, the magnet 810 of the big money access switch can be operated to step that switch to a desired position to select one of the twelve RAM's of a pool. The position of this access switch is tested by operation of the push button 823 to light the lamp corresponding to the position occupied by the switch. In a similar manner, through momentary operation of the key 2SK, magnet 860, of the $2.00 access switch, can be operated to step that switch to select a particular RAM. Through this arrangement one RAM can be routined over the $2.00 channel and simultaneously another RAM can be routined over the big money channel should it be desired to do so.

Continuous Routine of One RAM

It may be advantageous to insert a large number of bets in one RAM after that RAM has been repaired and readjusted to make sure that the repairs have produced the desired results. To accomplish this, the repeat key, FIG. 7, is operated to disengage its A spring from its break contact, thereby opening the circuit over which runner step relay 740 was operated, and as a result the foregoing cycle of 1, 10, 11, 50, 100, 55, or 110 set of bets can be placed in the selected RAM, and these cycles of bets repeated indefinitely.

Stopping the Routine

By moving the B spring of the repeat key, FIG. 7, out of its engagement with its break contact and into engagement with its make contact, when the circuit previously traced to runner step relay is closed, that circuit will be extended over conductor 953 to stop relay 960, instead of to runner step relay 740. Upon operating, relay 960, at spring 962 and its make contact, closes a holding circuit from positive on conductor 948, to maintain the relay operated so long as the start key RSK is in operated position. At springs 961, relay 960 opens the previously traced circuit of relay 610 to maintain that relay deenergized even after the remainder of the points in the circuit thereof are closed by the restoration of the various relays and magnets.

Reset

The various switches of the routiner are restored to their home positions through the operation of reset keys. When the reset key shown in FIG. 9 is operated to move its A spring into engagement with its make contact, the obvious circuit for the magnet 920 is completed through wiper 922 to move that switch into engagement with its tenth bank contact, and through the B spring of this key positive is applied to the tenth bank contact so that the magnet 920 operates in buzzerlike fashion until wiper 922 moves into engagement with its twentieth or home position contact. Engagement of the C spring of this key with its make contact places positive on the contacts 1 to 19 of the bank engaged by wiper 933 of the cycle count switch, causing that switch to operate in buzzerlike fashion until its wipers are moved into engagement with their twentieth or home position contacts.

Moving the runner reset key, FIG. 7, into operating position extends positive through its A spring and its make contact to the bank contacts engaged by wiper 803 of the $2.00 access switch and through the B spring of this key and its make contact, to the contacts in the bank of the big money access switch engaged by wiper 813, whereupon these switches operate in buzzerlike fashion until the wipers are positioned upon their respective twentieth or home position contacts.

The foregoing description of the operation of the routiner in connection with the win pool applies to routining of the place pool and also the show pool in the same manner, if the pool selecting keys KP and KS are operated simultaneously with the key KW and the various keys in the place and show sections of the routiner are operated in the same manner as the keys KF, KH, KT, K5 and K2 of the win section of the routiner. During operation of the routiner a set of bets will will be inserted in the three pools simultaneously, and when all of the acceptance relays in the three pools have been operated the chain circuit of conductor 941 will be completed to operate the relay 900 as above explained.

Combine Section Operation

The combine section of the routiner may also be operated simultaneously with the other sections by operating combine key KC, FIG. 7, and the various keys such as K6C and K15C in the combine section of the routiner. The circuit of the upper winding of the $6.00 acceptance relay 720 is completed in the manner illustrated in FIG. 2 of the drawings, as is the circuit of the upper winding of the $15.00 acceptance relay 730.

Upon operation of these and other relays in the combine section, the chain circuit of conductor 941 is extended through the section, through springs 722 and 732, to operate relay 900 as before.

From the foregoing, it will be apparent that through the operation of the routiner of the present invention the TAM and RAM's of each pool in a totalisator system can

be tested simultaneously with the RAM's in the pool tested in sequence. The routiner can be set to routine only one of the pools or two of the pools in addition to all three pools simultaneously. The number of bets inserted in the various adding machines can be varied over wide limits and as a result the operation of the various adding machines can be thoroughly checked in a convenient manner prior to each day's operations at a track.

In the drawings and description I have shown the routiner of the present invention as it will be applied to a two-circuit totalisator system of the type described in my above mentioned co-pending application. The routiner of the present invention may also be applied to other totalisator systems and such application is contemplated.

While I have chosen to show and describe my invention by illustrating a preferred embodiment thereof, I am aware that many modifications and adaptations can be made by one skilled in the art and such is contemplated.

Having thus complied with the statutes and shown and described the preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. Equipment for testing the total adding machine, the plurality of individual runner adding machines and the collector of a totalisator by registering predetermined amounts in said adding machines, which equipment comprises:

a plurality of acceptance relays;

an access switch for selecting said runner adding machines one at a time in sequence;

a motor magnet for said switch;

means including a pair of relays for initiating an operation of said collector to establish circuits from the total adding machine through the collector and said acceptance relays one at a time and to the runner adding machine selected by said switch, over which circuits total and selected runner adding machines are operated to register amounts therein and the acceptance relays are operated one at a time;

a release relay operated over a circuit through a chain of contacts on said test acceptance relays when all of said test acceptance relays have been operated;

a step relay operated over a circuit closed responsive to the operation of said release relay;

and means responsive to the operation of said step relay for operating said access switch to select the next runner adding machine to which said test is then applied.

2. Test equipment as specified in claim 1, in which a three-position key is included in the circuit of the step relay which in a first position prepared the circuit to that relay and in a second position opens that circuit to cause the test to be applied repeatedly to a selected runner adding machine, and in which there is a stop relay the circuit of which is prepared by the said key in its third position, which circuit is closed responsive to the operation of the release relay to stop the test.

3. Equipment for testing the total adding machine, the plurality of individual runner adding machines and the collector of a totalisator by registering predetermined amounts in said adding machines, which equipment comprises:

a plurality of acceptance relays;

an access switch for selecting said runner adding machines one at a time in sequence;

a motor magnet for said switch;

means including a pair of relays for initiating an operation of the collector to establish circuits from the total adding machine through the collector and said acceptance relays one at a time to the runner adding machine selected by said switch, over which circuits the total and selected runner adding machines are operated to register amounts therein and said acceptance relays are operated in sequence;

and means responsive to the operation of all of said acceptance relays for operating said magnet to step said access switch to select the next runner adding machine to which said test is then applied.

4. Test equipment as specified in claim 3, in which the means for stepping the switch includes a release relay operated over a circuit that extends through a chain of contacts on said acceptance relays and is closed when all of said relays have operated; a routine count switch having a magnet the circuit of which is closed by the operation of said release relay to step the count switch; a cycle relay operated over a circuit closed by the operation of said release relay after said count switch has been operated through a predetermined number of steps; and means responsive to the operation of said cycle relay for operating said magnet to operate the access switch to select the next runner adding machine to which said test is then applied.

5. Test equipment as specified in claim 4, in which the means responsive to the operation of the cycle relay includes a cycle count switch having a magnet the circuit of which is closed by the operation of the cycle relay; and a step relay operated over a circuit closed by the operation of the cycle relay after said cycle count switch has taken a predetermined number of steps, to operate the magnet of the access switch to select the next runner adding machine to which said test is then applied.

6. Test equipment as specified in claim 4, in which the circuit of the cycle relay extends through a wiper on the routine count switch, and in which there is a three-position key selectively operable to determine the number of steps the switch must take to close said circuit and operate the relay.

7. Test equipment as specified in claim 6, in which operation of the key to one position opens a point in the circuit of the magnet of the count switch and prepares the circuit of the cycle relay for immediate closing by the operation of the release relay; operation of the key to a second position prepares the circuit of the cycle relay for closing upon the tenth operation of the release relay; and operation of the key to a third position prepares the circuit of the cycle relay for closing upon the eleventh operation of the release relay.

8. Test equipment as specified in claim 4, in which the circuit of the step relay extends through a wiper on the cycle count switch and in which there is a three-position key selectively operable to determine the number of steps the switch must take to close said circuit and operate the relay.

9. Test equipment as specified in claim 8, in which operation of the key to one position opens a point in the circuit of the magnet of the cycle count switch and prepares the circuit of the step relay for immediate closing by the operation of the cycle relay, operation of the key to a second position prepares the circuit of the step relay for closing upon the fifth operation of the cycle relay, and operation of the key to a third position prepares the circuit of the step relay for closing upon the tenth operation of the cycle relay.

10. Equipment for testing a totalisator system that has win, place and show totalisators and a combine unit, with each totalisator having a total adding machine, a plurality of individual runner adding machines, and a collector, and in which there is a collector individual to the combine unit, which equipment applies tests to the system by registering predetermined amounts in each of the adding machines in each totalisator, and comprises:

a section for each totalisator and a section for the combine unit;

a plurality of acceptance relays in each test section;

an access switch having a bank engaging wiper for each section of the test equipment and a magnet for operating said wipers step-by-step over their respective banks to select the individual runner adding machines in each totalisator one at a time in sequence;

a pair of relays in each test section operated to start in operation the collector in the totalisator corresponding to that test section and to prepare circuits to the acceptance relays in that section, said collectors operating independently to close circuits from the total adding machines through the collector and acceptance relays to the runner adding machines selected by said switch, over which circuits the adding machines are operated to register amounts therein and the acceptance relays are operated;

a release relay operated over a circuit that extends through chain contacts on said acceptance relays in all of said sections and closed when all of said relays have operated;

and means responsive to the operation of said release relay for operating said magnet to operate the switch and thereby select the next runner adding machines in the totalisators.

11. Equipment for testing a totalisator having a total adding machine and a plurality of individual runner adding machines, each of which machines is operable over two channels to register amounts, and a collector individual to each of said channels, which equipment applies tests to the adding machines and collectors by registering predetermined amounts in the adding machines, and comprises:

a pair of access switches each operable to select said runner adding machines over one of said channels one at a time in sequence;

a motor magnet for each switch, each having a pair of normally closed contacts;

a plurality of acceptance relays each associated with one of said switches and each having a pair of windings and a normally closed pair of contacts;

a test relay operated over a circuit closed through said pairs of magnet contacts to prepare circuits through closed contacts on and one of the windings of each of said acceptance relays and to prepare a holding circuit for the acceptance relay;

a start relay operated to close a collector start circuit for each acceptance relay, said collectors operating to close said prepared circuits from the total adding machine through the collector, the acceptance relay and the access switch associated therewith to the runner adding machine selected thereby, over which circuit the adding machines are operated to register an amount therein and the acceptance relay is operated to open said circuit;

normally open contacts closed by the operation of an acceptance relay to extend said holding circuit through the other winding of that relay to hold it operated;

a release relay;

a circuit for said release relay that extends through a chain of normally open contacts on said acceptance relays and closed when all of said relays are operated to operate the release relay;

means responsive to the operation of said release relay for operating said magnets which open said magnet contacts thereby to restore said test relay, the acceptance relays, the release relay and the magnets, said magnet restoration operating said switches to select the next runner adding machines and reclosing the circuit of the test relay to operate that relay preparatory to repeating the test on said next runner adding machines.

12. Equipment for testing a totalisator having a total adding machine, a collector, and a plurality of individual runner adding machines, which equipment applies tests to the adding machines and collector by registering predetermined amounts in the adding machines, and comprises:

a group of acceptance relays each having a pair of windings and a normally closed pair of contacts;

an access switch for selecting said runner adding machines one at a time in sequence and having a magnet and normally closed contacts opened by the operation of said magnet;

a test relay operated over a circuit closed through said normally closed magnet contacts to prepare circuits through the normally closed contacts on and one of the windings of each of said acceptance relays;

a hold circuit for said acceptance relays prepared by the operation of said test relay;

a start relay operated to close a collector start circuit to the collector for each acceptance relay in the group, said collector operating to close said prepared circuits, one at a time, which circuits extend from the total adding machine, through the collector, the normally closed contacts on and the one winding of the acceptance relay, thence through the access switch to the runner adding machine selected thereby to operate the adding machines to register an amount therein and to operate the acceptance relay which opens said circuit;

normally open contacts on each acceptance relay closed by the operation thereof to extend said hold circuit to the other winding of the relay to maintain it operated;

a release relay;

a circuit for said release relay, extending through a chain of other normally open contacts on said acceptance relays, closed when all of said contacts are closed to operate said release relay;

other normally open contacts on said acceptance relays;

a hold circuit for said release relay extended through said latter contacts in parallel to maintain the release relay operated so long as an acceptance relay is operated;

means responsive to the operation of said release relay for operating said magnet which opens its normally closed contacts to restore said test relay, said acceptance relays and finally said release relay and magnet, said magnet upon restoring operating said switch to select the next runner adding machine and reclosing the circuit of said test relay to operate that relay preparatory to repeating the test on said next runner adding machine.

13. Equipment for testing a totalisator having a total adding machine, a collector, and a plurality of individual runner adding machines, which equipment applies tests to the adding machines and collector by registering predetermined amounts in the adding machines, and comprises:

a plurality of acceptance relays;

a key associated with each of said relays;

normally open contacts on said key closed by an operation thereof to prepare a point in the start circuit of the collector and to prepare a point in the circuit of the associated acceptance relay;

a pair of normally open contacts on each acceptance relay through which contacts a chain circuit is extended;

and normally closed contacts on each key shunting the normally open contacts on the associated acceptance relay to permit extending said chain when said key and the associated acceptance relay remain in normal position.

14. Test equipment as specified in claim 13, in which there is a start relay, associated with said keys and acceptance relays, operable to close said key prepared start circuits and in which normally closed contacts on said start relay close a circuit that shunts said normally closed key contacts and said normally open relay contacts.

References Cited in the file of this patent

UNITED STATES PATENTS

2,622,802 Hundley ..... Dec. 23, 1952
2,828,072 Helsel et al. ..... Mar. 25, 1958

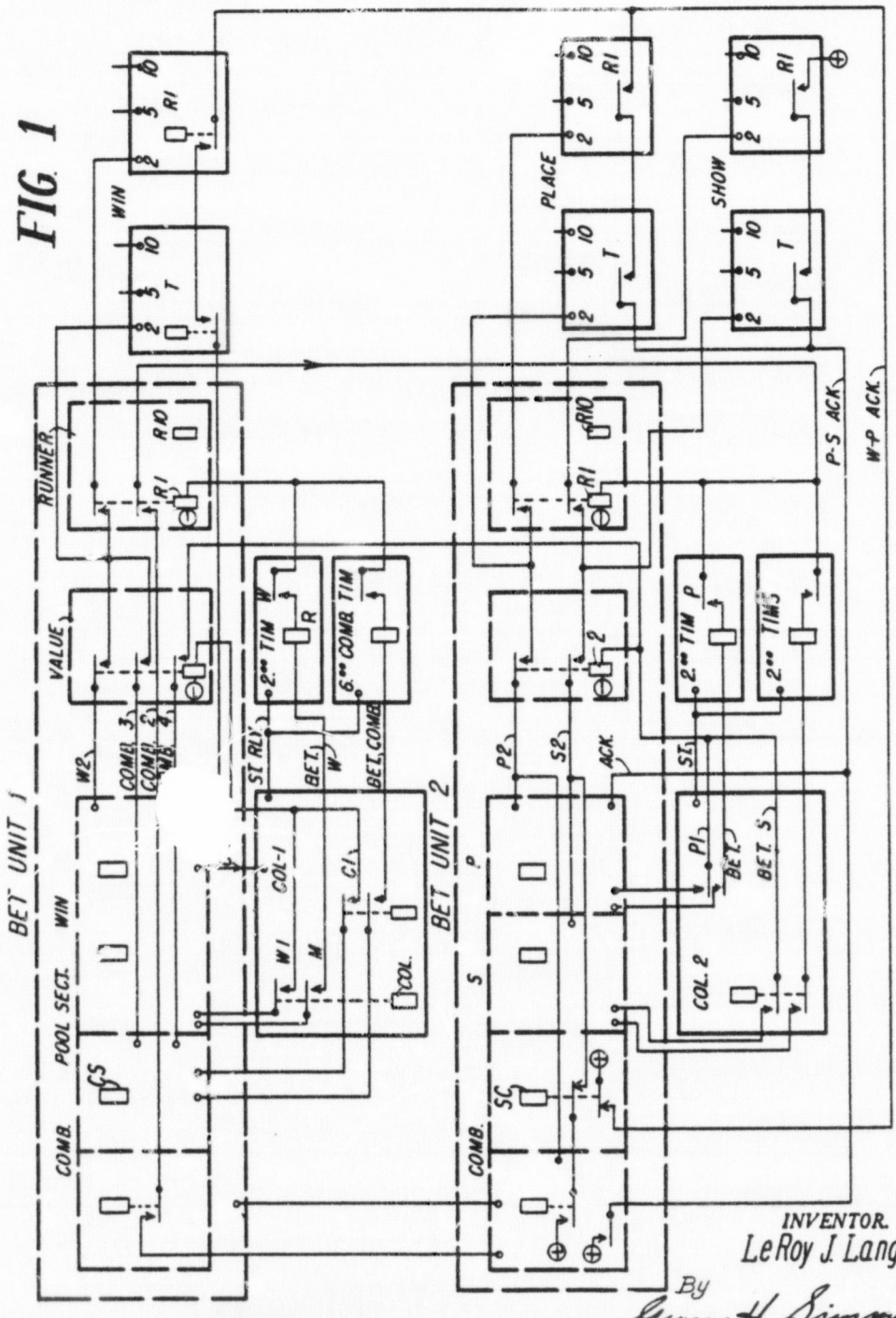
A646

March 5, 1963 LE ROY J. LANGE 3,080,114

TOTALISATOR SYSTEM

Filed July 8, 1960 4 Sheets-Sheet 1

FIG. 1



INVENTOR.
LeRoy J. Lange

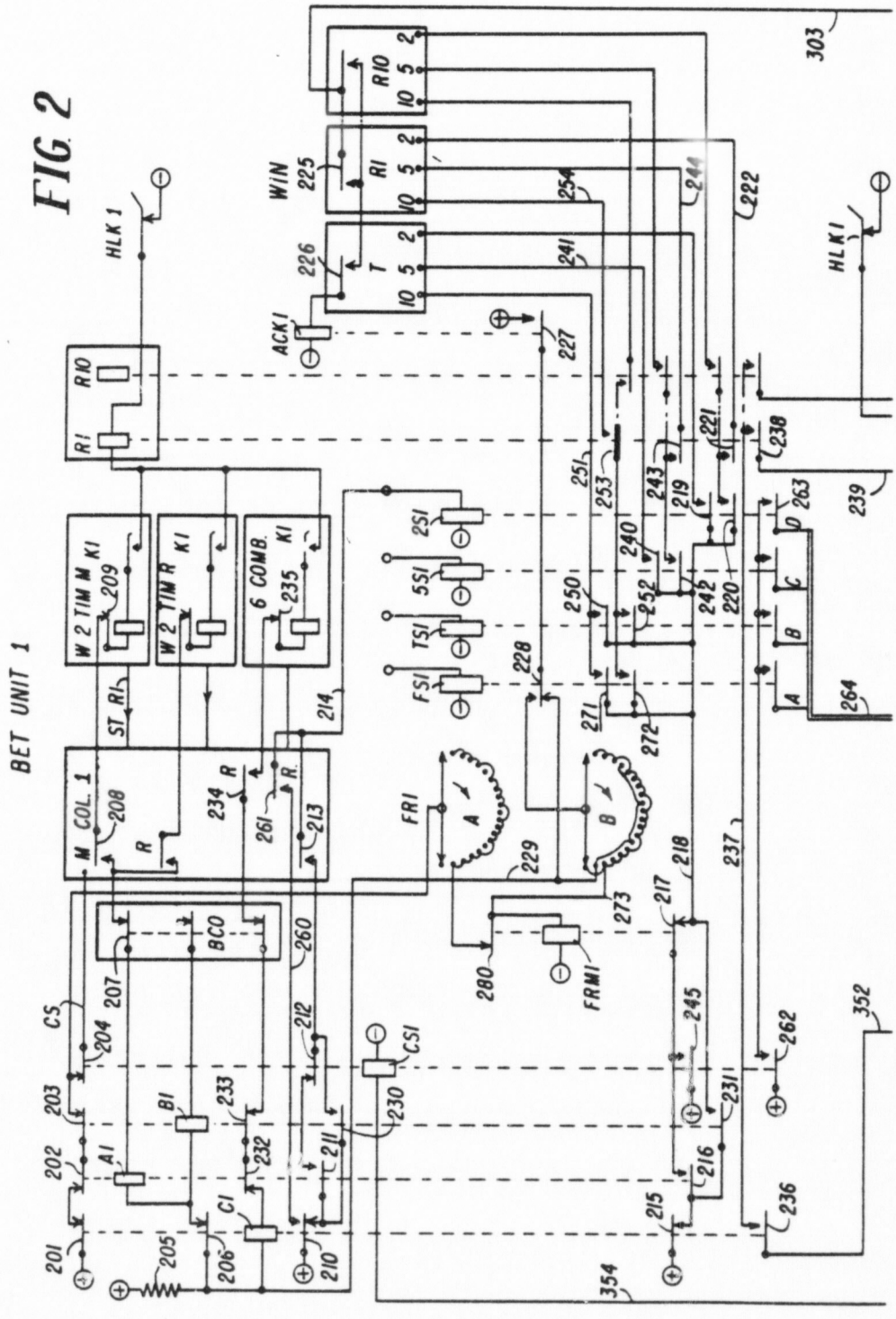
By George H. Simmons
Atty

March 5, 1963 LE ROY J. LANGE 3,080,114

TOTALISATOR SYSTEM

Filed July 8, 1960 4 Sheets-Sheet 2

FIG 2

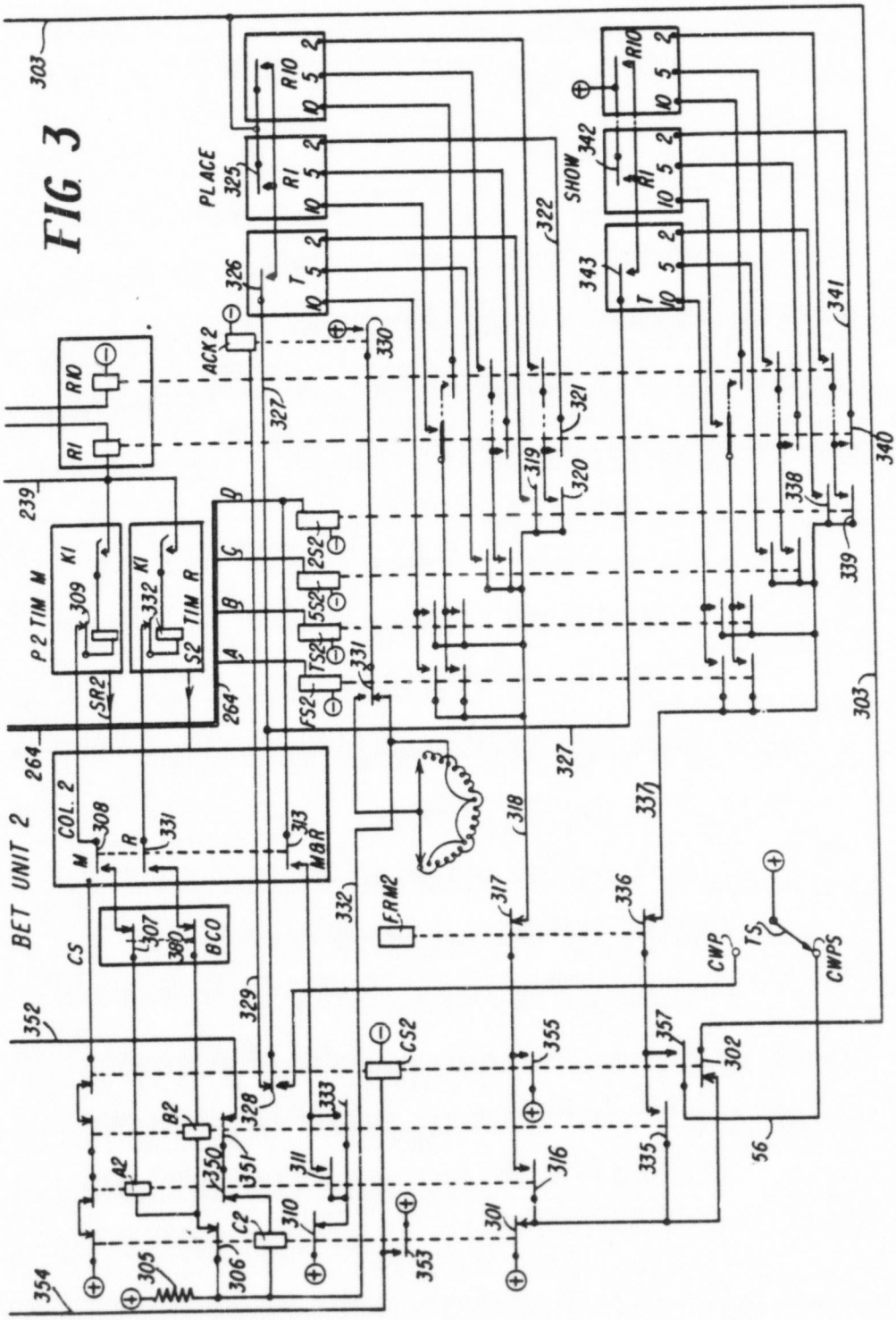


March 5, 1963 LE ROY J. LANGE 3,080,114

TOTALISATOR SYSTEM

Filed July 8, 1960 4 Sheets-Sheet 3

FIG 3

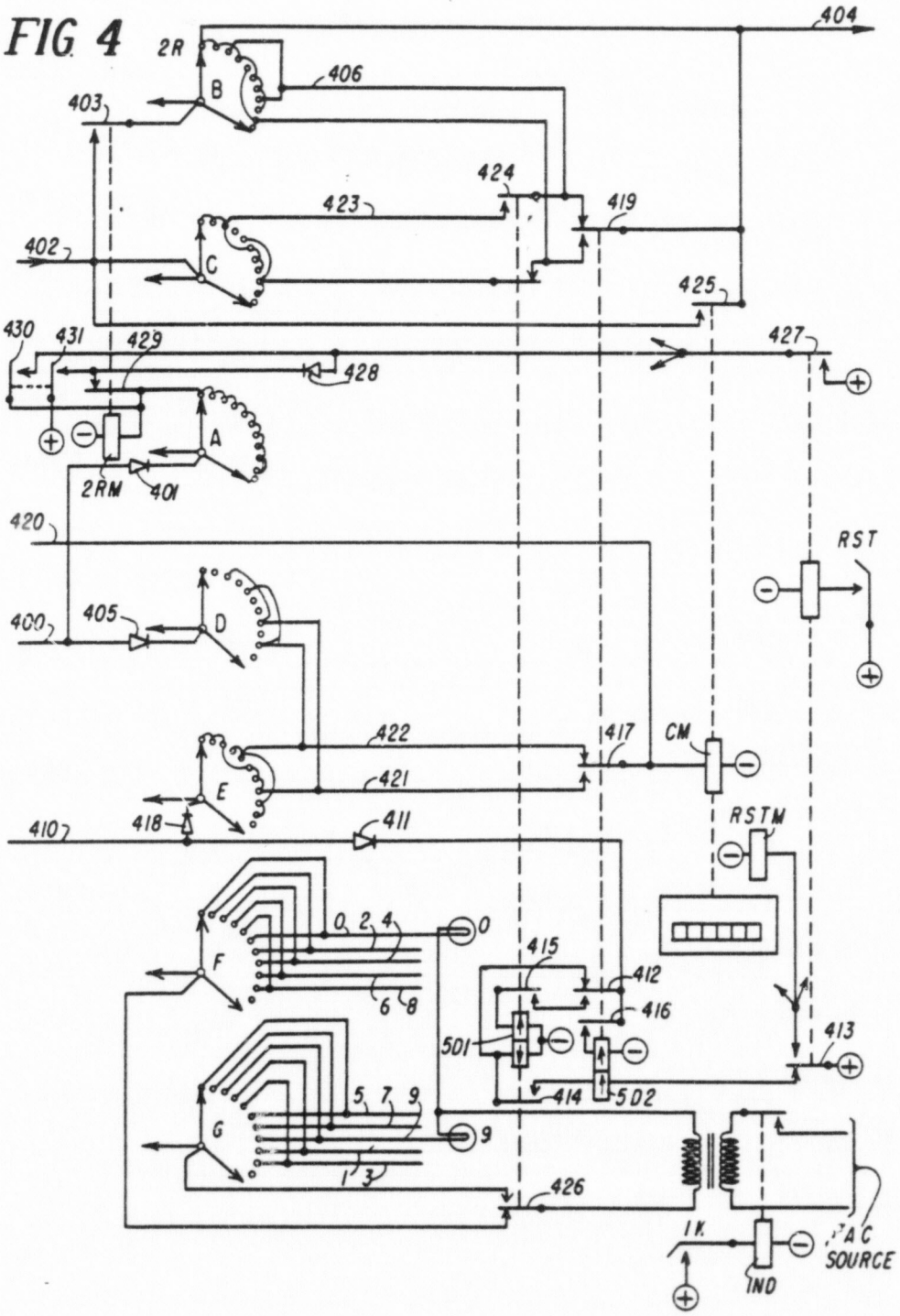


March 5, 1963 LE ROY J. LANGE 3,080,114

TOTALISATOR SYSTEM

Filed July 8, 1960 4 Sheets-Sheet 4

FIG. 4



United States Patent Office

3,080,114
Patented Mar. 5, 1963

3,080,114
TOTALISATOR SYSTEM

Le Roy J. Lange, Towson, Md., assignor to American Totalisator Company Division of Universal Controls, Inc., Towson, Md., a corporation of Maryland

Filed July 8, 1960, Ser. No. 41,671
14 Claims. (Cl. 235—92)

This invention relates to totalisator systems and has for its principal object the provision of a new and improved system of this kind.

It is a main object of the invention to provide a totalisator system of the counter type, in which a relatively large number of ticket machines can be handled by a relatively small amount of equipment without unduly delaying operations of the ticket machines.

Another object of the invention is to provide a two channel totalisator system in which win pool and combine bets are handled over a first channel and place and show bets are handled over a second channel.

Another object of the invention is to provide a two channel totalisator system in which each channel is equipped with a bet unit containing pool selecting, value selecting and runner selecting sections, and in which there is a collector associated with and individual to each bet unit.

Another object of the invention is to provide a totalisator system having two collectors and two bet units in which combine ticket issuing machines are connected to the first bet unit through the first collector and in which the second bet unit is operated through the first bet unit independently of the second collector and in which registrations of combine bets in the three pools of the system are controlled through the thus operated two bet units.

Another object of the invention is to provide adding machines each having three operating channels leading thereinto and in which a channel is selected by a value selecting relay in the bet unit, which relay is operated through the collector relay associated with an operated ticket issuing machine.

Another object of the invention is to provide a multichannel adding machine operable by a single pulse over a channel to effect registration in the machine of a value corresponding to the value of that channel.

Another object of the invention is to provide a high speed counter type totalisator system that is of simple design that can be manufactured and maintained at low cost without sacrificing quality and accuracy.

Further objects of the invention, not specifically mentioned here, will be apparent from the detail description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

FIG. 1 is a block diagram of the system;

FIG. 2 is a schematic diagram of the first channel equipment and the ticket issuing machines and adding machines associated therewith;

FIG. 3 is a diagram similar to FIG. 2 and showing the second channel equipment; and

FIG. 4 is a schematic diagram of an adding machine.

The totalisator system of the present invention is a two channel system which in the example shown is arranged so that the first channel handles win pool and combine bets and the second channel handles place and show bets. Each channel is equipped with a bet unit consisting of three sections, a pool selecting section containing three bet relays and a combine slave relay, a value selecting section containing a relay for each value to be registered, and a runner selecting section containing a relay for each runner, preferably ten in number. Associated with each bet unit is a collector individual thereto and preferably a

direct acting collector of the type shown in Levy Patent 2,179,698, issued November 14, 1939, modified for reflex operation in the manner shown in my co-pending application, Serial No. 845,395, filed October 9, 1959.

The system includes three counter cabinets, one for each pool, each containing a total adding machine and a plurality of runner adding machines. Each of these adding machines is accessible over any one of three channels depending upon the value of the bet being registered. The adding machines are all identical and are interchangeable.

The ticket machines which are of known type, shown in Black Patents 1,886,626 and 1,886,627, issued November 8, 1932, contain an acceptance relay and a plurality of keys through the operation of which keys a particular runner is selected. Each ticket machine is arranged to print tickets of predetermined value in a predetermined pool, or in the case of combine ticket machines in two or three pools.

As will be seen in FIG. 1, the pool selecting section of the bet unit provides collector start positive over conductor CS to the associated collector. Operation of a key in a ticket machine, such as for example $2.00 TIM W associated with the main path M of the collector, closes a circuit for the start relay associated with that TIM in the collector. When its turn is reached, the collector relay associated with that TIM operates and the bet circuit Bet W is extended from the pool selecting section of bet unit 1 through the path M of collector COL1, through the TIM, to the runner selecting relay corresponding to the operated key, assumed to be R1.

A value selecting circuit W1 is also extended from the pool selecting section through make contacts on the collector relay through the operation of which the bet circuit is extended to the value selecting relay corresponding to the operated TIM which in this case will be the $2.00 relay. A control circuit W2 is then extended from the pool selecting section of the bet unit, through make contacts on the operated value selecting relay, thence to the Win total adding machine over the $2.00 channel leading thereto. A branch of this circuit extends through make contacts on the operated runner selecting relay to the corresponding runner adding machine over the $2.00 channel. Operation of both of these adding machines extends an acknowledging circuit back to the pool selecting section to mark the completion of the registration of the bet. The ticket machine is then tripped and operated to print and issue ticket and the bet circuit is opened to restore the operated devices.

In a similar manner, operation of the $2.00 TIM P to place a $2.00 bet in the place pool operates the collector associated with bet unit 2 to extend the place bet circuit from the place section P of the pool selecting section, through the collector, the operated TIM and the runner selecting relay corresponding to the operated key. The value selecting circuit P1 is extended to operate the value relay assumed to be the $2.00 relay. The P2 operating circuit is then extended from the pool selecting section of the bet unit, through make contacts on the operated value selecting relay, thence over the $2.00 channel to the total adding machine of the place pool, with a branch of this circuit extending through make contacts on the operated runner selecting relay to the corresponding runner adding machine over the $2.00 channel leading thereto. Operation of both adding machines extends an acknowledging circuit back to the bet unit 2, marking the completion of the registration of the bet and operating the acceptance relay of the TIM to initiate an operation of the TIM to print and issue the ticket and to open the bet circuit.

As shown, place pool bets are handled over the main

path through the collector COL2, and show pool bets are handled over the reflex path therethrough.

In a similar manner, operation of the $2.00 TIM S extends operating circuits to the total and selected runner adding machines in the show pool cabinet. Operation of these machines extends an acknowledging circuit back to the bet unit and the acceptance relay of the TIM is operated to initiate an operation thereof to print and issue the ticket and to open the bet circuit.

Combine tickets, for example $6.00 combines, require registration of $2.00 in the win pool, $2.00 in the place pool, and $2.00 in the show pool. Combine TIM's associated with the first channel of the system are handled over the reflex path of collector COL1. Operation of the $6.00 combine TIM operates the collector and when the associated collector relay operates and the collector is operating on the reflex path the combine bet circuit is extended from the combine section of the pool selecting section of the bet unit 1, through make contacts on the collector relay, through the TIM and the runner selecting relay corresponding to the operated key. The value selecting circuit C1 is then extended to operate the value selecting relay which, in the example shown, is the $2.00 relay.

A circuit is then extended from the combine selecting section of the bet unit 2 through the corresponding section of bet unit 1, through make contacts on the operated runner selecting relay of bet unit 1, and through the corresponding runner selecting relay of the bet unit 2. The operated relay in the combine section of bet unit 2 closes a circuit to combine slave relays in both bet units and the operate circuit COMB3 is closed to register $2.00 in the total counter and selected runner counter of the win pool. An operate circuit is also extended over conductor COMB4, through make contacts on the operated value selecting relay of bet unit 1, to the corresponding relay of bet unit 2, operating that relay. The combine section of bet unit 2 then extends an operate circuit over conductor P2 to operate the total and selected runner counters of the place pool to register $2.00 in each of these counters. The combine section of bet unit 2 also extends an operate circuit over conductor S2 to the total and selected runner counters of the show pool to register $2.00 therein. The acknowledging circuit is completed by the operation of all counters and extends from positive through the selected runner counter of the show pool, thence through the total counter of that pool, thence through the total counter of the place pool, thence through the selected runner counter of that pool, thence through the selected runner counter of the win pool, through the total counter of that pool, to the bet unit 1, and the acceptance relay of the combine TIM is operated to initiate an operation of that TIM to print and issue the ticket and to open the bet circuit.

It will be apparent that except when combine bets are being registered, the channel 1 over which win bets are registered operates independently of channel 2 over which place and show bets are registered.

It will also be apparent that since circuits to the value selecting relays are closed by the collector relay that is operated to close the bet circuit, both TIM's handled by each collector relay over the main and reflex paths through the collector, respectively, must be assigned to issue tickets of the same value. These tickets may be in different pools however.

It will also be noted that registration of combine bets is controlled by bet unit 1, and that although the pool selecting section of bet unit 2 and the value selecting and runner selecting sections thereof are utilized in the registration of combine bets the collector associated with the bet unit 2 is not employed. Through this arrangement when the combine bet circuit is closed by operation of the collector associated with bet unit 1, the completion of circuits necessary to effect registration of the combine bet is effected as soon as the place and show selecting relays of bet unit 2 return to normal regardless of the position occupied by collector COL2 at the moment. This arrangement speeds up the registration of combine bets and hence speeds up the system with a minimum of interference with the placing of place and show bets by the placing of combine bets in these pools.

Of the three value channels leading into the adding machines, one is a two dollar channel, and a single pulse over this channel registers $2.00 in the machine. The second is a five dollar channel, and a single pulse thereover registers $5.00 in the machine. The third is a ten dollar channel, and a single pulse thereover registers $10.00 in the machine. Five pulses are sent over the third value channel to register $50.00 in the machine. Since each value except $50.00 is registered by delivery of a single pulse to the adding machines, less time is required for registrations than in counter totalisators which require a plurality of pulses to effect registrations. This further speeds up operation of the system.

As a result of this speeding up of operations, a relatively large number of ticket issuing machines can be handled by a relatively small amount of totalisator equipment without unduly delaying betting. The number of ticket machines that can be handled over a channel of the system depends upon the number of start and collector relays in the collector. In one instance where each collector was provided with twenty-four start and twenty-four collector relays, the collector handled forty-eight ticket machines, twenty-four over its main path and twenty-four over its reflex path. The system so equipped handled a total of ninety-six ticket machines without unduly delaying betting.

Referring now to the drawings in more detail, from FIG. 2 it will be seen that the pool selecting section of bet unit 1 contains a relay A1 which is operated over the main and reflex paths of the collector to select the win pool, a relay B1 not used in this unit, a combine relay C1 also operated over the reflex path of the collector, and a combine slave relay CS1.

The bet unit also contains runner selecting relays indicated as ten in number, of which only relays R1 and R10 are shown. The bet unit contains four value selecting relays 2S1 operated to prepare circuits to the adding machines over the $2.00 channel leading thereto, the $5.00 relay 5S1 for the $5.00 channels, the $10.00 relay TS1 for the $10.00 channels, and the $50.00 relay FS1 which also prepares circuits for operating the adding machines over the $10.00 channels. Associated with the relay FS1 is a $50.00 rotary switch FR1 through the operation of which the adding machines are operated five times over the $10.00 channel to register $50.00 bets therein.

Registering a $2.00 Bet on Runner Number One in the Win Pool

When the totalisator is prepared for operation, the BCO contacts are closed and maintained closed throughout betting in known manner. Positive is supplied to the collector COL1 over conductor CS, through break contacts 201, 202, 203 and 204. Operation of a key in the ticket machine W2 TIM–M in known manner extends a circuit over start conductor STR1 to the start relay of the collector associated with that TIM. When its turn is reached, the collector relay associated with the operated TIM operates in the manner fully explained in the above mentioned Levy patent and closes the bet circuit which may be traced from positive through resistance 205, break contacts 206, through the winding of relay A1, make contacts 207 on the BCO relay, make contacts 208 on the collector relay, through the break contacts 209 of the acceptance relay of the operated TIM, through the key K1 therein, through the R1 relay to negative, through the runner lockout key HLK1. Relays A1 and R1 operate over this circuit but the acceptance relay of the TIM being marginal does not operate at the moment. Operation of relay A1 opens contacts 202 thereby to remove positive from conductor CS to halt further operation of COL1.

Operation of relay A1 closes a circuit from positive through spring 210 and its break contact, make contacts 211, break contacts 212, make contacts 213 on the operated collector relay, conductor 214, through the winding of relay 2S1 to negative, operating that relay.

A circuit may now be traced from positive through spring 215 and its break contact, make contacts 216, break contacts 217, conductor 218, through make contacts 219, $2.00 conductor leading to the total adding machine T in the win pool, with a branch of this circuit extending through make contacts 220, make contacts 221, over conductor 222, leading to the runner number one adding machine R1 in the win pool, over the $2.00 channel.

When both of these adding machines have been fully operated, an acknowledging circuit may be traced from positive on spring 301 and its break contact, break contacts 302, conductor 303, through make contacts 225, make contacts 226, through the acknowledging relay ACK1 to negative, operating that relay. Operation of relay ACK1 closes make contacts 227 extending positive through spring 228 and its break contact, over conductor 229 to the junction of resistance 205 and break contacts 206, thereby short-circuiting the resistance to increase the current flowing through the acceptance relay of the TIM, operating that relay to initiate an operation of the TIM to print and issue the ticket. Operation of this acceptance relay of the TIM also opens break contacts 209 thereby opening the circuit of A1 and R1 which restore.

In a similar manner operation of a key in TIM W2R closes the bet circuit through the relay A1, the make contacts 207 of the BCO, the make contacts R of the collector relay, to the R1 relay. The previously traced circuit for the relay 2S1 is closed now by the operation of make contacts 211 and the previously traced circuits to the total and runner one adding machines are closed now by make contacts 216.

Thus registrations in the win pool may be completed over either the main or reflex channels of the collector.

Placing a $2.00 Bet on Runner Number One in the Place Pool

Operation of a key K1 in P2 TIM–M to select runner number one closes a circuit which may be traced from positive through resistance 305, break contacts 306, through the A2 relay, make contacts 307 of the BCO, make contacts 308 of the collector COL2, through break contacts 309 and the acceptance relay of the operated TIM, through the key K1 therein, through the R1 relay of the second bet unit to negative, through the runner lockout key HLK1, operating relays A2 and R1.

A circuit may now be traced from positive through spring 310 and its break contact, make contacts 311, make contacts 313 of the collector, through relay 2S2 to negative, operating that relay.

A circuit may now be traced from positive through break contacts 301, make contacts 316, break contacts 317, conductor 318, make contacts 319, thence over channel 2 leading to the total adding machine T in the place pool, with a parallel branch extending through make contacts 320, make contacts 321, conductor 322, leading over the $2.00 channel to the runner number one adding machine R1 of the place pool.

When both of the adding machines have operated, positive previously traced through conductor 303 is extended through make contacts 325, make contacts 326, conductor 327, through spring 328 and its break contact, conductor 329, through acceptance relay ACK2 to negative, operating that relay. At make contacts 330 relay ACK2 extends positive through spring 331 and its break contact, conductor 332, leading to the junction of resistance 305 and break contacts 306, thereby short-circuiting the resistance to increase the current flowing through the acceptance relay of the operated TIM sufficiently to operate that relay to initiate a ticket printing and issuing operation of the TIM and to open the bet circuit by opening break contacts 309.

Registering a $2.00 Bet on Runner Number One in the Show Pool

Operation of a key K1 in S2 TIM–2 closes the circuit to the associated start relay of the collector 2 in known manner and when the associated collector relay's turn is reached and that relay operates with the collector operating on its reflex path a circuit may be traced from positive through resistance 305, break contacts 306, the B2 relay, make contacts 330 of the BCO relay, make contacts 331 on the collector relay, break contacts 332 and the acceptance relay of the operated TIM key K1 therein, through the relay R1 to negative. Operation of relay B2 closes make contacts 333 thereby extending positive through spring 310 and its break contact, make contacts 333, thence over the previously traced circuit to relay 2S2, operating that relay.

A circuit may now be traced from positive through break contacts 301, make contacts 335 break contacts 336, conductor 337, make contacts 338, thence over the $2.00 channel to the total adding machine T of the show pool, with a branch of this circuit extending through make contacts 339, make contacts 340, conductor 341, of the $2.00 channel of the R1 adding machine of the show pool, operating that adding machine.

When both adding machines have fully operated, the acknowledging circuit is extended from positive through make contacts 342, make contacts 343, conductor 327, spring 328 and its break contact, conductor 329, to the relay ACK2 to negative, operating that relay.

The previously traced circuit for short-circuiting resistance 305 is closed by operation of relay ACK2, thereby to operate the acceptance relay of the operated TIM to initiate a ticket printing and issuing operation of that TIM and to open the bet circuit at break contacts 332.

Registering a $5.00 Bet in the Win Pool

Operation of a $5.00 win TIM, not shown, to select runner number one, closes bet circuits as above and closes an operate circuit, not shown, for the relay 5S1. The operate circuit for the adding machines previously traced to conductor 218 is then extended to make contacts 240 over conductor 241 and the $5.00 channel of the total adding machine in the win pool, with a branch of this circuit extending through make contacts 242, make contacts 243, conductor 244, to the R1 adding machine over the $5.00 channel. Operation of the adding machines closes the acknowledging circuit as above.

Registering a $10.00 Bet in the Win Pool

In a similar manner operation of a $10.00 win TIM, not shown, completes bet circuits and an operate circuit for relay TS1, and the operate circuit for the adding machines previously traced to conductor 218 is then extended to make contacts 250 and conductor 251 leading to the total adding machine over the $10.00 channel, with a branch of this circuit extending through make contacts 252, make contacts 253, conductor 254, leading to the R1 adding machine over its $10.00 channel. The operations of both of these adding machines closes the acknowledging circuit in the hereinbefore explained manner.

Registering a $50.00 Bet in the Win Pool

In a similar manner, operation of a $50.00 TIM in the win pool, not shown, completes the bet circuit as above and an operate circuit for the relay FS1. The previously traced operate circuit for the adding machine traced through conductor 218 is now extended to make contacts 271 and thence over conductor 251 to the total adding machine, and through make contacts 272 and thence over the previously traced circuit through conductor 254 to the R1 adding machine.

Upon completion of the operation of both of these adding machines, the circuit of relay ACK1 is completed as before and the acknowledging circuit closed by operation of springs 227 is now extended through spring 228 and its make contact, through the B wiper of the $50.00 rotary FR and the home position contact in its bank engaged thereby, conductor 273, through the winding of the magnet FRM1 to negative operating that magnet.

Operation of magnet FRM1 opens the operate circuit of the adding machines by opening break contacts 217, the adding machines restore and the acknowledging circuit is thus restored and the circuit of magnet FRM1 opened, permitting that magnet to restore and advance the wiper B into engagement with the first contact in its bank. It will be observed that contacts 1, 2 and 3 are multipled together, hence the above operation will be repeated three more times to move wiper B into engagement with the fourth contact in its bank, the adding machines being operated once for each step for the switch FR. When the acknowledging circuit is closed for a fifth time, it is extended through wiper B in engagement with its fourth bank contact, thence over conductor 229 to short circuit resistance 205 and thereby complete the registration of the $50.00 bet in the adding machine.

Registering $5.00, $10.00 and $50.00 Bets in the Place and Show Pools

Registering of these bets in the place pool operates circuits through bet unit 2 in the same manner as above explained when COL2 closes the bet circuit over its main path for the place pool and over its reflex path for the show pool. These operations otherwise duplicate those just described in connection with win pool bets and need not be repeated.

It will be noted that although bet unit 2 duplicates bet unit 1, I have simplified both units by showing only the parts thereof involved in the operations handled by the unit, thereby avoiding complication of the drawing that is unnecessary to a complete understanding of the invention by one skilled in the art.

Registering a $6.00 Combine

In FIG. 3, I have shown a toggle switch TS which when operated in one position places positive on contact CWPS, this being the position occupied by the toggle switch when the system is set to issue $6.00 combine tickets. In some instances $4.00 or $10.00 combines are to be issued, in which case the toggle switch is moved to place positive on contact CWP thereby to effect registration of these combines in the win and place pools only. Thus the system may be set to handle combines in either two or three pools but not in both at the same time.

Operation of a key K1 in the TIM 6 COMB operates collector 1 and when the collector relay associated with this TIM is operated the bet circuit is completed from positive through resistance 205, relay C1, break contacts 232 and 233, BCO make contacts, make contacts 234 on the collector relay, break contacts 235, and the acceptance relay of the operated TIM, key K1 therein, through the winding of runner selecting relay R1 to negative, operating this relay.

It may happen that at the moment the above bet circuit is completed, relay A2 or relay B2 of bet unit 2 may be operated and the registration of a place or show bet in progress as a result thereof. As soon as this registration is completed and these relays restore, a circuit may be traced from positive through resistance 305, relay C2, break contacts 350 and 351, conductor 352, through make contacts 236, conductor 237, make contacts 238 closed by operation of relay R1, conductor 239, through relay R1 of bet unit 2 to negative, operating relays C2 and R1.

Operation of relay C2 closes make contacts 353 thereby closing the obvious circuit for combine slave relay CS2, which positive extends over conductor 354 and the combine slave relay CS1 to negative, operating those relays.

Operation of relay C1 as above closes a circuit from positive through spring 210 and its make contact, conductor 260, through make contacts 261 on the operated collector relay, conductor 214, through relay 2S1 to negative, operating relay 2S1.

Operation of slave relay CS1 extends positive through make contacts 262, make contacts 263, through the D conductor in cable 264, through the winding of relay 2S2 to negative, operating that relay.

Registration of $2.00 in each of the three pools and in the total and runner one adding machines therein is now achieved, the win pool registration over the circuit from positive through make contacts 245 and thence over the previously traced circuits to the T and R1 adding machines of the win pool, and the place pool registration extended by positive through make contacts 355 and thence over the previously traced circuit to the total and runner one adding machines of the place pool. The show pool registration is completed from positive through the toggle and CWPS contact therein, conductor 356, make contacts 357, and thence over the previously traced circuit to the total and runner one adding machines in the show pool.

When all of these above adding machines have been operated, the acknowledging circuit is extended from positive through make contacts 342 in the show R1 adding machine, make contacts 343 in the show total adding machine, conductor 327, through make contacts 326 in the total place adding machine, make contacts 325 in the place R1 adding machine, conductor 303, make contacts 225 and 226 in the win R1 and total adding machines to acknowledging relay ACK1 to negative, operating that relay. The previously traced circuit to short circuit resistance 205 is completed by the operation of ACK1 and the acceptance relay of the 6C combine ticket machine is operated to initiate a ticket printing and issuing operation of that machine and to open the circuit of relay C1 and R1 at break contacts 235. These relays restore and as a result the other operated relays are restored.

It will be noted that although the combine relay C2, the runner selecting relay such as R1, and the value selecting relay such as 2S2 in the bet unit 2, are operated to register combine bets, the collector COL2 is not involved in such registration. As a result of this, place and show portions of combine bets may be placed simultaneously in their respective pools the instant that the A2 and B2 relays return to normal, regardless of the position at which the collector COL2 is operating at the moment. Since it is not necessary in the registration of a combine bet to wait until COL2 arrives at a predetermined point in its chain of operation, registration of combine bets is speeded up and as a result the operation of the entire system is speeded up, and furthermore registration of combine bets is effected with a minimum of interference with the registration of place and show bets over the second channel of the system.

In the event that the system is set to issue $4.00 combine tickets which require registration only in the win and place pools, the toggle switch is moved into engagement with contact CWP and no registration in the show pool is effected. When the win and place adding machines have operated, positive is placed on the acknowledging circuit through contacts CWP and spring 328 and its make contact and thence extended over the perviously traced circuit of the acknowledging relay ACK1.

$15.00 combine tickets may be issued and the registration thereof in the three pools is effected in the hereinbefore explained manner except that the value selecting relay 5S1 is operated instead of the relay 2S1, and the circuits to the adding machines enter over the $5.00 channels leading thereto rather than over the $2.00 channels as above. If the system is set to issue $10.00 combines and the toggle switch is in engagement with contact CWP, registrations are effected only in the win and place pools as above.

The Adding Machines

The adding machines of this system, shown in FIG. 4, consist of an 11-point rotary switch that is equipped with seven wipers and through the operation of this switch $2.00 values are registered in the machine. The adding machines also include a pair of relays through the operation of which $5.00 values are registered, and a counter which may be of the type shown in Patent 2,444,570, which counter is operated to register values in steps of $10.00 each. The adding machines include a projection indicator which may be of the type shown in Patent 2,931,027, issued March 29, 1960, which indicator functions to display the units digit of values registered in the machine.

$2.00 registrations are effected by positive placed on conductor **400** and extending through diode **401** and the A wiper of the stepping switch, through the winding of the magnet 2RM of the switch **2R** to negative. It will be noted that the first ten contacts in the bank engaged by the A wiper are miultipled together so this circuit will be completed regardless of the position occupied by this wiper. When the operating circuit is opened, magnet 2RM restores and advances the wipers of the switch one step.

Positive placed on conductor **400** also extends through diode **405** to the D wiper of the switch, to operate the magnet CM of the counter, as will presently appear.

$5.00 values are registered by positive placed upon conductor **410** and extended through diode **411**, through spring **412** and its break contact, through the lower winding of differentially wound relay **5D1** to negative, operating that relay. When this positive is removed, positive is extended through spring **413** and its break contact, through the lower winding of relay **5D2**, through make contacts **414**, over which circuit relay **5D2** operates and relay **5D1** is maintained operated. The next positive placed upon conductor **410** extends a circuit through spring **412** and its make contact, make contacts **415**, through the upper winding of relay **5D1** to negative, and since this relay is differentially wound the energization of both of its windings closes the relay to restore. This same positive maintains relay **5D2** operated over the circuit through make contacts **416** and the upper winding of this relay to negative.

$10.00 values are registered by positive placed upon conductor **420** and extended through magnet CM to negative to operate that magnet thereby to advance the counter one step.

With the wipers of switch **2R** in the position shown, zero is registered in the switch. When $4.00 is registered in the switch, wiper D will engage the third contact in its bank, and if at the moment relay D2 is operated, indicating a $5.00 registration, the total of $9.00 will be registered and the counter must be operated upon the receipt of the next $2.00 value. The positive traced to the D wiper under these conditions is extended over conductor **421**, through the spring **417** and its make contact, through magnet CM to negative, to operate that magnet. When the D wiper is engaged with the fifth contact in its bank, $8.00 will be registered in the switch 2R and the receipt of another $2.00 value requires operation of the counter if there is no $5.00 value registered. Under these circumstances positive traced to the D wiper is extended over conductor **422**, through spring **417** and its break contact, to the magnet CM to negative, to operate that magnet.

Obviously the receipt of every second $5.00 value requires operation of the counter. Positive placed upon conductor **410** is extended through diode **418** to the E wiper of switch 2R and when that wiper is engaged with any one of the first three contacts in its bank and relay **5D2** is operated, this positive is extended over conductor **421** through spring **417** and its make contact, magnet CM to negative, to operate that magnet. When the E wiper is engaged with either the fourth or fifth contact in its bank, denoting the registration of $6.00 or $8.00 in the switch, receipt of another $5.00 value requires operation of the counter and positive on the E wiper is extended over conductor **422** and spring **417** and its break contact, through the magnet CM to negative.

Acknowledging Circuit

As explained hereinbefore, positive is fed into the runner adding machine over conductor **303**, for example, which conductor is connected to conductor **402**. With the switch in the position shown, when magnet **2RM** is operated, this positive is extended through make contacts **403**, through the B wiper in its home position, to conductor **404** leading to the total adding machine of the pool, or to the acknowledging relay as the case may be. When the B wiper is in engagement with the third contact in its bank, as it will be when $4.00 is registered in the switch, and there is no $5.00 registration in the machine, positive traced to the B wiper extends over conductor **406** through spring **419** and its break contact, and thence to conductor **404** leading out of the adding machine.

When one $5.00 value is registered and relay **5D2** operated thereby, and the C wiper is engaging any one of the first three contacts in its banks, positive on conductor **402** is extended over conductor **423** through make contacts **424**, through spring **419** and its break contact to conductor **404**. When the C wiper engages either the fourth or fifth contact in its bank, denoting registration of $6.00 or $8.00 in the switch, and relay **5D1** is operated by the registration of a single $5.00 value in the machine, the total registration amounts to $11.00 or $13.00, and no circuit is completed through the C wiper; rather the acknowledging circuit is extended through the B wiper as before.

Operation of the magnet CM closes make contacts **425**, thus directly connecting conductor **402** to conductor **404** to complete the acknowledging circuit directly through the adding machine.

When it is desired to read the values registered in the adding machine, indication key IK is operated to close the obvious circuit for indication relay IND which operates to extend the source of operating current to the transformer.

The circuit to the lamps in the projection type indicator is controlled through the F wiper when there is no $5.00 registration in the adding machine and spring **426** engages its break contact. Thus 0, 2, 4, 6 or 8 is indicated, depending upon the position occupied by the F wiper at the moment. If there is a $5.00 registration in the machine and relay **5D1** is operated as a consequence thereof, spring **426** engages its make contact and the indicator is controlled through the G wiper to indicate 1, 3, 5, 7 or 9, depending upon the position occupied by this wiper. The units digit of the value registered in the machine can thus be read and the remaining digits read from the counter.

The adding machine is restored to normal by operation of reset key RST which closes the obvious circuit for the reset relay. At spring **413** this spring applies positive to the reset magnet RSTM of the counter, restoring the indication thereon to zero in the manner explained in the above mentioned patent. Positive through make contacts **427** is extended through diode **428**, break contacts **429**, through the winding of magnet 2RM to negative, operating that magnet which interrupts its own circuit at break contacts **429** and advances the wipers of the switch until the wipers engage their eleventh contact in their respective banks. As the wipers move into engagement with this contact, off normal springs close and positive is extended through make contacts **430**, through the winding of the magnet to negative, holding that magnet operated so long as the reset key remains operated. When the reset key is restored, magnet 2RM restores and advances the wipers into the position shown.

It will be noted that during registration of values in the switch 2R, when the wipers thereof move into engagement with the eleventh contacts in their respective banks, the off normal switch will close and positive is extended through make contact 431 through break contacts 429 and the magnet 2RM to negative, operating that magnet to automatically step the wipers into engagement with the first contact in their respective banks.

It will be noted in FIG. 3 that the positive extended through break contacts 201, 202, 203, to conductor CS is also extended to wiper A of switch FR. Every fifth contact in the bank engaged by wiper A is an open contact, and the other contacts are multiplied together and connected through break contacts 280 to magnet FRM1. Normally wiper A always engages an open contact; however, if for any reason another contact is engaged, when positive is applied to CS and wiper A, the switch will be operated in buzzerlike manner until wiper A moves into engagement with an open contact.

From the foregoing it will be apparent that the adding machines of the present system are of simple construction and are operated to register all values except $50.00 by the transmittal of a single pulse to the machine. As a result of this, speed is gained without sacrificing quality. The bet units which are of simple construction are operated to complete circuits for the registration in their respective pools, and in the case of combine bets both bet units are operated under the control of the first bet unit and collector associated therewith and without waiting for the collector associated with the second bet unit to arrive at predetermined points in its chain of operation. As a result, the system of the present invention is able to handle a relatively large number of ticket issuing machines with a relatively small amount of simple equipment without unduly delaying the operation of the ticket machines and hence delaying betting.

While I have chosen to illustrate my invention by showing and describing the preferred embodiment of it, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown ahd described my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. In a totalisator system; a bet unit containing pool selecting means consisting of two relays, value selecting means and runner selecting means; two groups of counters each containing a total adding machine and a plurality of runner adding machines, each of which adding machines is operable over a plurality of channels; a plurality of ticket issuing machines, each arranged to issue tickets of a predetermined value in a predetermined pool, and each having a plurality of keys operable one at a time to select a particular runner; a collector containing two paths; means responsive to the operation of a key in a ticket machine for operating said collector to close a circuit through the runner selecting means, the ticket machine and the first pool selecting relay over the first path through the collector to select the first group of counters when the tickets issued by the ticket machine are in the pool corresponding thereto and to close a circuit through the runner selecting means, the ticket machine and the second pool selecting relay over the second path through the collector to select the second group of counters when the tickets issued by the ticket machine are in the pool corresponding thereto; means responsive to the operation of said pool selecting means for operating the value selecting means corresponding to the value assigned to the connected ticket machine; and means responsive to the operation of said pool selecting means, said runner selecting means and said value selecting means for operating said total adding machine and the selected runner adding machine to register therein the value assigned to said operated ticket machine.

2. In a totalisator system; a bet unit containing pool selecting means, value selecting means and runner selecting means; a plurality of ticket issuing machines associated with said bet unit, each arranged to issue tickets of predetermined value in a predetermined pool, and each having a plurality of keys operable one at a time to select a particular runner; a collector operable in response to an operation of a key in a ticket machine to close a circuit over which are operated the pool selecting means corresponding to the pool to which the ticket means is assigned and the runner selecting means corresponding to the operated key; means responsive to the operation of said pool selecting means for operating the value selecting means corresponding to the value assigned to the connected ticket machine; a group of counters corresponding to the operated pool selecting means and containing a total adding machine and a plurality of runner adding machines, each of which adding machines is operable to register two dollars upon its receipt of a single pulse over a two dollar channel, is operable to register five dollars upon its receipt of a single pulse over a five dollar channel, and is operable to register ten dollars upon its receipt of a single pulse over a ten dollar channel, said value selecting means comprising a relay for each of said channels operable to select that channel; and means responsive to the operation of said pool selecting means, said runner selecting means and said value selecting means for operating said total adding machine and the selected runner adding machine to register therein the value assigned to said operated ticket machine.

3. A totalisator system as specified in claim 2, in which the bet unit contains a fifty dollar value relay and a stepping switch operable upon operation of said value relay to send five pulses over the ten dollar channels of the adding machines thereby to register fifty dollars in those machines.

4. A totalisator system as specified in claim 1 in which each adding machine comprises: a stepping switch having a magnet and a plurality of wipers; a first circuit incoming to said machine over which said magnet is operated to effect registration of two dollars in the machine; a pair of relays; a second circuit incoming to said machine, over which said relays are operated to effect registration of five dollars in the machine; an electromagnetically operated counter; and a third circuit incoming to said machine, over which the magnet of said counter is operated to effect registration of ten dollars in said machine.

5. An adding machine as claimed in claim 4, in which there is means including a first wiper on said switch and bank contacts engaged thereby for extending said first circuit to said magnet when the addition of two dollars to the amount registered in the machine requires an operation of the counter.

6. An adding machine as claimed in claim 4, in which there is means including a second wiper on said switch for extending said second circuit to said magnet when the addition of five dollars to the amount registered in the machine requires an operation of the counter.

7. An adding machine as claimed in claim 4, in which there is an indicator in which there are a plurality of lamps selected one at a time by one of a pair of wipers on said switch and in which there is a means for lighting a selected lamp, including a circuit controlled by contacts on one of said relays to light that lamp and thereby indicate the units digit of an amount registered in the machine.

8. An adding machine as claimed in claim 4, in which an acknowledging circuit incoming to the machine is extended through and out of the machine over one of a pair of wipers on said switch and contacts on said relays.

9. An adding machine as claimed in claim 8, in which contacts closed by an operation of the magnet extends

the acknowledging circuit through the machine independently of said wipers and relay contacts.

10. In a totalisator system, a plurality of combine ticket issuing machines each assigned to issue combine tickets of predetermined value and each having a plurality of runner selecting keys; a pair of bet units each containing a combine bet and a combine slave relay, a plurality of runner selecting relays and a plurality of value selecting relays; a collector associated with each bet unit; win, place and show pool counter groups each containing a total and a plurality of runner adding machines each operable over a plurality of incoming channels; means responsive to the operation of a runner selecting key in one of said ticket machines for operating the collector associated with the first bet unit to establish circuits over which the combine and combine slave relays, the selected runner relays corresponding to the operated key, and the value selecting relays corresponding to one-third of the value of tickets issued by the operated ticket machine, in both bet units are operated; and means responsive to the operation of said relays for operating the total and selected runner adding machines in each pool, over the incoming channels selected by the operated value selecting relays to register the value of said ticket one-third in each pool.

11. A totalisator system as specified in claim 10, in which each bet unit contains an acknowledging relay and in which operation of said adding machines completes a circuit for the acknowledging relay of the first bet unit to operate that relay and in which operation of said acknowledging relay closes a circuit that causes the operated ticket machine to operate and to open the circuit over which the first mentioned operated relays were operated, thereby causing the release of all of said operated relays.

12. In a totalisator system: a pair of bet units each containing runner selecting relays, value selecting relays, a combine bet relay, and a combine slave relay; a plurality of combine ticket issuing machines each containing a plurality of runner selecting keys and each assigned to issue combine tickets of predetermined value; a collector individual to each bet unit; win, place and show pool counter groups each containing a total adding machine and a plurality of runner adding machines each of which adding machines is operable over a plurality of incoming channels; means responsive to the operation of a runner selecting key in one of said ticket machines for operating the collector individual to the first bet unit to close a circuit through the combine and selected runner selecting relays in the first bet unit to operate those relays; means responsive to the operation of said combine relay for closing a circuit through said operated collector to the value selecting relay of the first bet unit corresponding to that portion of the value assigned to the operated ticket machine that is to be registered in the win couner; means also responsive to the operation of said combine relay for closing a circuit through the combine and selected runner relays in the second bet unit; means responsive to the operation of said second combine relay for operating the combine slave relays in both bet units; means responsive to the operation of said slave relay in the first bet unit for operating the value selecting relay of the second bet unit that corresponds to the operated value selecting relay of the first bet unit; and means also closed by said slave relays for operating the total and selected runner adding machines in the win, place and show pools over the incoming channels selected by said operated value relays to effect registrations in said machines.

13. A totalisator system as specified in claim 12, in which each bet unit also contains a pair of pool selecting relays and in which the circuits of the combine bet relay in each bet unit extends through contacts on the pool selecting relays closed when the relays are in normal position thereby to prevent operation of the combine bet relay of the second bet unit so long as either pool selecting relay in that unit is operated.

14. A totalisator system as claimed in claim 12, in which the combine ticket machines are assigned to issue tickets that require registration only in the win and place pools and in which a toggle switch associated with the second bet unit is operated to eliminate the show pool from registrations controlled by the second bet unit.

References Cited in the file of this patent

UNITED STATES PATENTS

2,121,164	Robinson	June 21, 1938
2,195,267	Bush	Mar. 26, 1940
2,432,324	May	Dec. 9, 1947
2,479,681	Hadley	Aug. 23, 1949
2,605,967	Stone	Aug. 5, 1952

A656

Oct. 26, 1943. H. C. ROBINSON 2,332,756

TOTALIZER SYSTEM

Filed Sept. 5, 1939 5 Sheets-Sheet 1

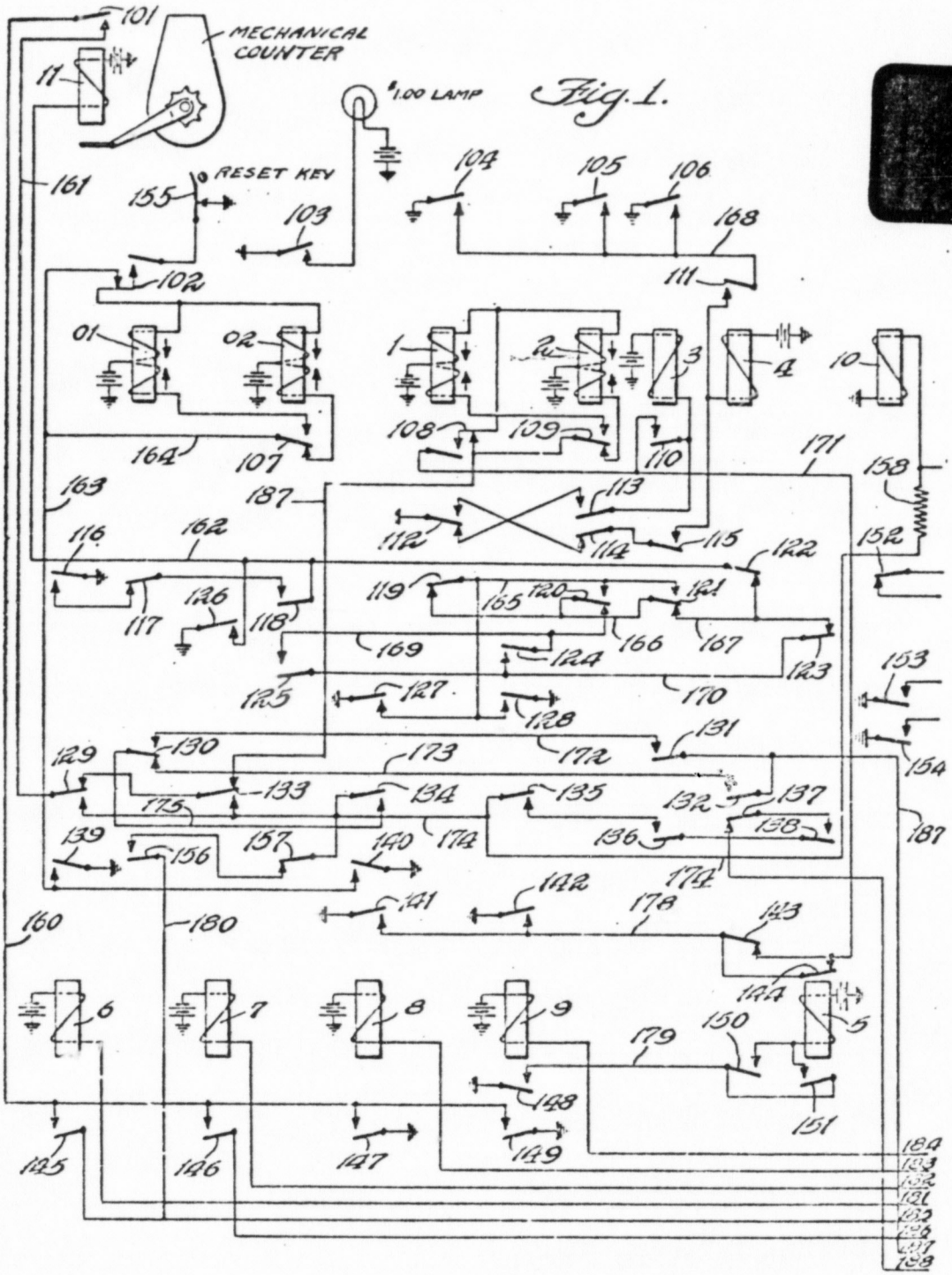


Fig. 1.

INVENTOR
Harold C. Robinson
BY George H. Simmons
ATTORNEY.

A657

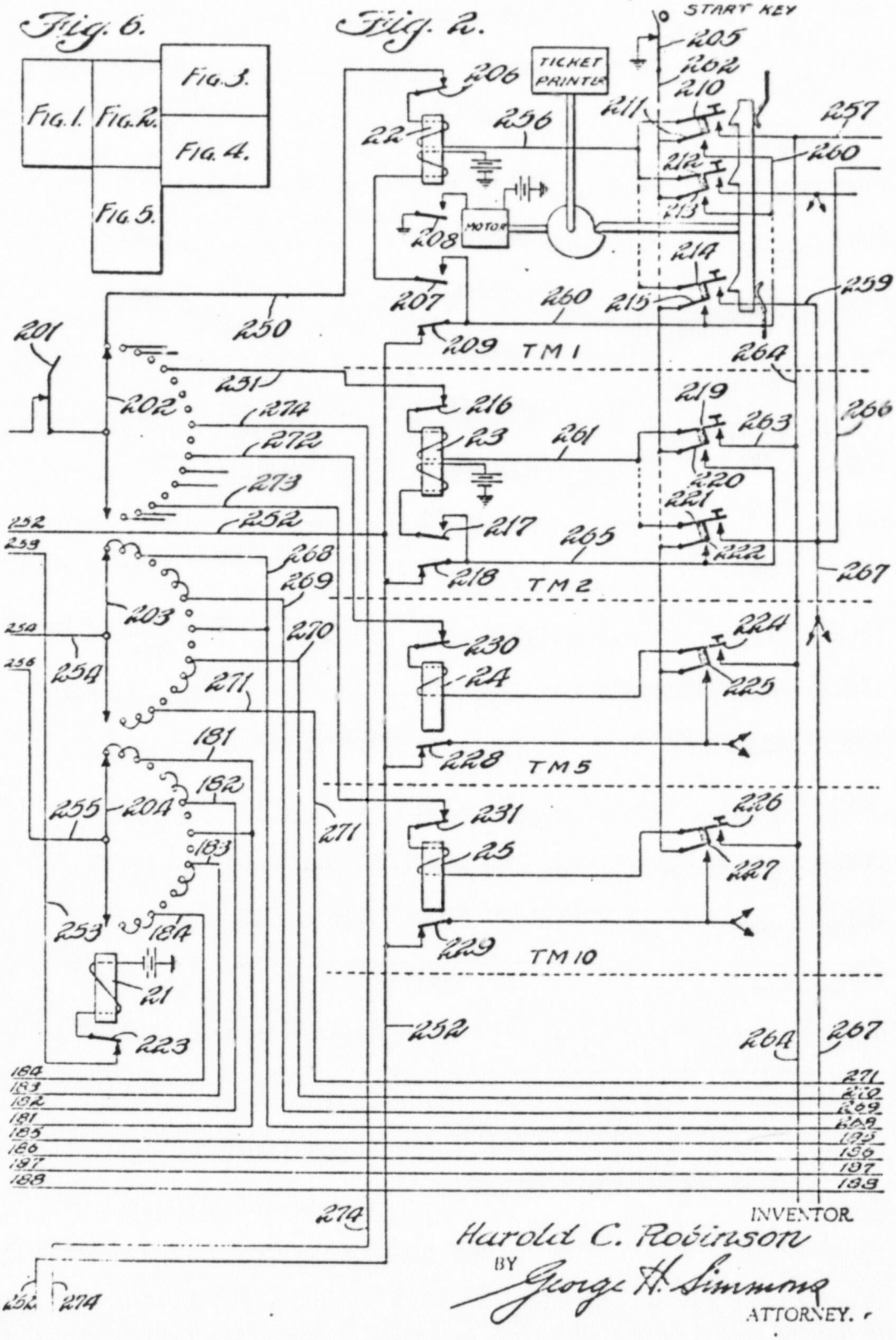
Oct. 26, 1943. H. C. ROBINSON 2,332,756

TOTALIZER SYSTEM

Filed Sept. 5, 1939 5 Sheets-Sheet 2

Fig. 6.

Fig. 2.



INVENTOR
Harold C. Robinson
BY
George H. Simmons
ATTORNEY.

A658

Oct. 26, 1943. H. C. ROBINSON 2,332,756

TOTALIZER SYSTEM

Filed Sept. 5, 1939 5 Sheets-Sheet 3

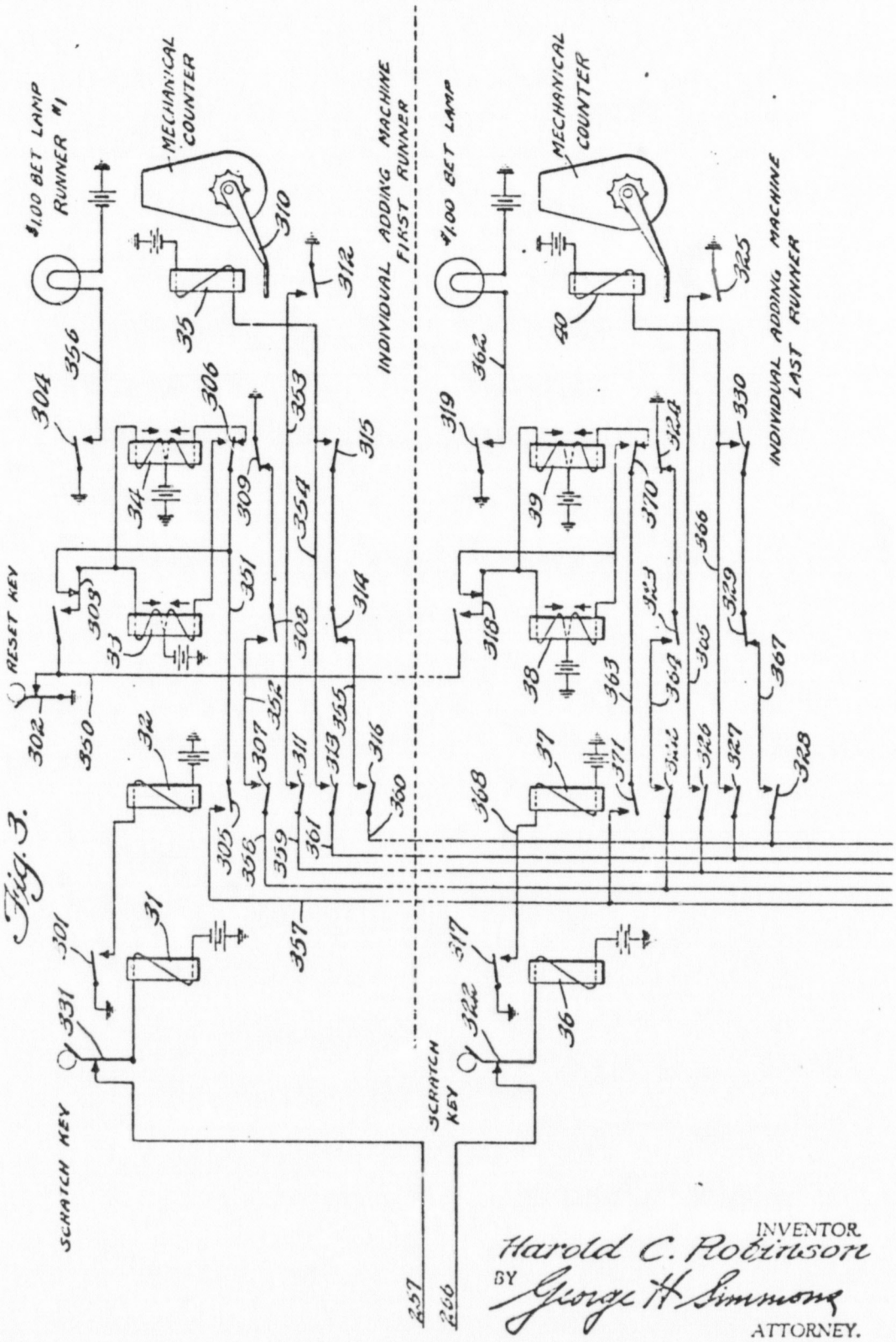


Fig. 3.

INVENTOR
Harold C. Robinson
BY George H. Simmons
ATTORNEY.

Oct. 26, 1943. H. C. ROBINSON 2,332,756

TOTALIZER SYSTEM

Filed Sept. 5, 1939 5 Sheets-Sheet 4

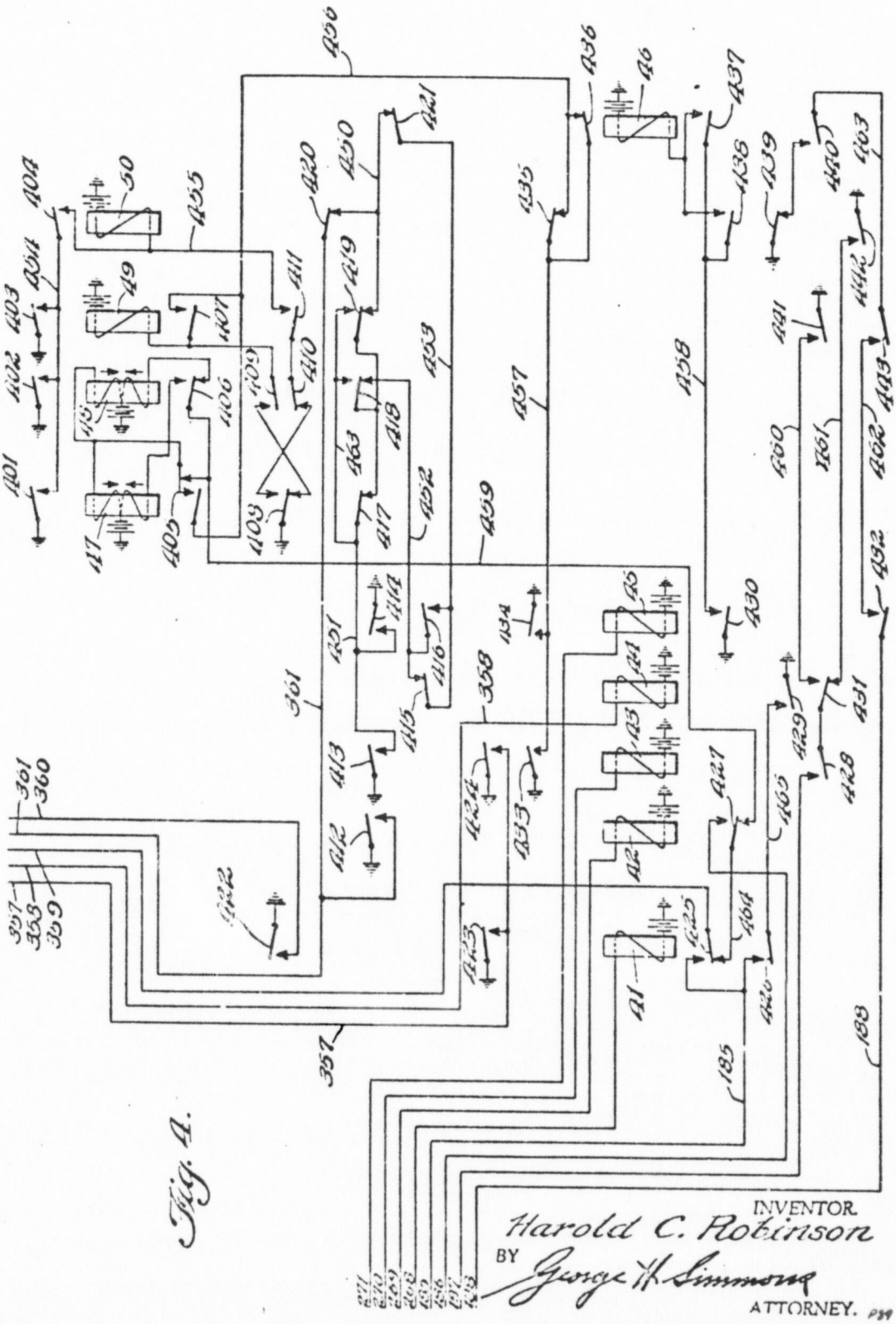


Fig. 4.

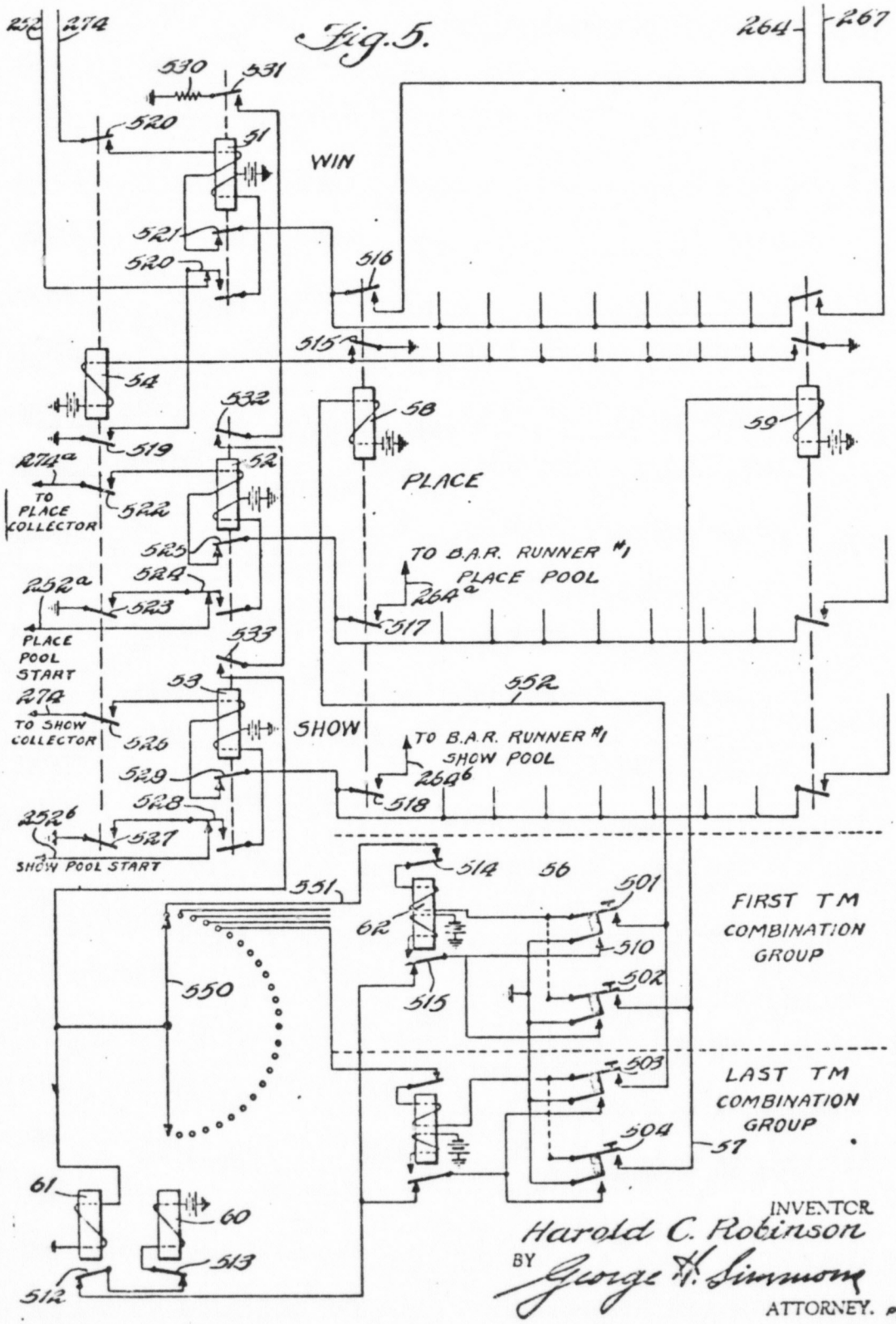
INVENTOR
Harold C. Robinson
BY George H. Simmons
ATTORNEY.

A660

Oct. 26, 1943. H. C. ROBINSON 2,332,756

TOTALIZER SYSTEM

Filed Sept. 5, 1939 5 Sheets-Sheet 5



INVENTOR
Harold C. Robinson
BY George H. Simmons
ATTORNEY.

Patented Oct. 26, 1943

2,332,756

UNITED STATES PATENT OFFICE

2,332,756

TOTALIZER SYSTEM

Harold C. Robinson, Baltimore, Md., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application September 5, 1939, Serial No. 293,367

15 Claims. (Cl. 235—92)

This invention relates to totalizer systems and has for its principal object the provision of a new and simplified system of this kind that is cheaper to manufacture, install, operate and maintain.

It is a main object of the invention to provide a simplified totalizer system that can be used under conditions where the cost of operating the systems of the prior art are prohibitive.

Still another object of the invention lies in the provision of a totalizer system that utilizes mechanical counters to register the issuance of tickets in a pool and also on the individual runner in that pool.

Still another object of the invention lies in the provision of a control means for the mechanical counters of the system arranged to operate those counters a predetermined number of times depending upon the value of the ticket to be issued.

Still another object of the invention lies in the provision of a totalizer system in which the ticket machines employed to print and issue the tickets are prevented from operating until the issuance of the ticket has been registered in a total adding machine and also in an individual runner adding machine.

Further objects of the invention, not specifically mentioned here, will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

Figure 1 is a schematic circuit diagram of the total adding machine of the system;

Figure 2 is a schematic circuit diagram of the collector and ticket machines;

Figure 3 is a schematic circuit diagram of two individual runner adding machines;

Figure 4 is a schematic circuit diagram of the control means for the group of individual runner adding machines;

Figure 5 is a schematic circuit diagram of the combination ticket issuing machines and control apparatus associated therewith; and

Figure 6 is a view showing how the figures are to be assembled.

A totalizer may be defined as a device arranged to count and add separately operations of each kind performed by several devices of a group, and to simultaneously count and add the total number of operations of all kinds performed by the devices of the groups, and to display such sums on suitable indicators. Thus when used in connection with a group of ticket issuing machines which are capable of issuing a number of kinds of tickets, the totalizer through individual adding machines counts and displays the number of tickets of each kind issued by all of the ticket machines in the group and also through a total adding machine counts and displays the total number of tickets of all kinds issued by all of the ticket machines of the group.

In the totalizer systems of the prior art of which I am aware, so much equipment has been employed that the expense of manufacturing, installing, operating and maintaining the equipment has been so high as to be prohibitive in a large number of instances. This fact has been recognized heretofore and as a result totalizer systems of various sizes have been devised to meet the various conditions encountered. One of these systems, known as the senior totalizer system and capable of handling several hundred ticket machines, is employed in installations where the volume of business done justifies that many ticket machines. A somewhat smaller system, known as the intermediate totalizer, is employed in smaller installations and a still smaller system, known as the junior totalizer and capable of handling only a small portion of the number of ticket machines that the senior totalizer is capable of handling, is extensively used. The present invention has for its principal object the provision of a still smaller totalizer system so that the service rendered by the system will be available in many cases where costs have heretofore been prohibitive.

When used in connection with the issuance of pari-mutuel tickets at a race track, totalizers have heretofore been too expensive for small tracks such as are to be found at county fairs and the like. The present system is designed to render the service available to such tracks.

In the prior art systems, tickets issued by the ticket machines have been registered in a total adding machine which registers all of the tickets issued in a particular pool, regardless of the runner upon which the ticket is issued, and individual runner adding machines have been employed to register the tickets issued on the individual runners. The sums accumulated by the individual and total adding machines have been displayed at various points through display panels, these displays being changed at frequent intervals so that the total amount in a pool and the amount upon each individual runner is at all times visible. In addition, the display panels have been provided with odds indicators giving the probable odds on a particular runner in the win pool.

BEST COPY AVAILABLE

In a system embodying the teachings of the present invention, the total number of tickets issued in a particular pool is registered in a total adding machine, as before, and the total number of tickets issued upon each individual runner is registered in an individual runner adding machine in that pool. No display boards are employed to indicate these totals but rather the totals are indicated only upon the registers. If desired, odds boards may be employed and the probable odds indicated as before.

In the preferred embodiment of the invention, the total number of tickets issued is counted and indicated by mechanical counters of the so-called "Veeder" type, these counters being operated electro-magnetically. Preferably, the counters are arranged to indicate the total number of $2.00 tickets that have been issued. Since at the smaller tracks $1.00 tickets are frequently issued, provision is made to store such issuance in the adding machine and to operate the mechanical counter once each time the odd dollar ticket sales total $2.00. Each time a $5.00 ticket is issued, the mechanical counter is operated twice and the remaining odd dollar is stored in the control equipment to be later combined with another odd dollar sum to operate the counter.

Referring now to the drawings, in Figure 1 the total adding machine is shown to comprise a counter, control relays 1 to 9 inclusive and odd dollar storing relays O1 and O2, with a bet accepting relay 10 arranged to control the operation of the machine. Of these instrumentalities, relays 1 to 9 inclusive, the contacts controlled thereby and the circuits extending through said contacts are the control unit of the total adding machine. Connected to the total adding machine is a collector, for convenience shown as a mechanical stepping switch having wipers which pass over a bank of contacts, usually twenty-five contacts being accessible to each wiper. Connected to the bank contacts over which one of the wipers passes are a plurality of ticket machines grouped according to the value of tickets to be issued thereby. Thus, for example, ticket machine TM1 is assumed to be one of a group of ticket machines adapted to print and issue a group of $1.00 tickets, TM2 is a ticket machine for issuing $2.00 tickets, TM5 is a ticket machine for issuing $5.00 tickets and TM10 is a ticket machine for issuing $10.00 tickets. The particular type of ticket machines is not of the essence of the present invention as there are a number of devices of this kind available upon the open market which may be used. Thus, for example, the ticket machines shown and described in the Black patents, Nos. 1,903,026 and 1,988,627, have been found to be satisfactory and reference is here made to these patents for the details of construction and operation of the machine.

In Figure 2, ticket machine TM1 has been diagrammatically shown, those parts of the machine directly involved in the present invention being shown in sufficient detail to enable a clear understanding of the invention. It is sufficient to note here that each ticket machine has a key for each runner, and that usually the machines are provided with twelve keys. Upon being depressed, the key is mechanically locked in operated position and is released only when the function of printing and issuing the ticket has been completed. Each machine is provided with a control relay such as relay 22 of TM1 which is directly involved in the operation of the present invention. Ticket machine TM1 is shown with sufficient parts indicated to skeletonize its operation, however, to avoid unnecessary complication of the drawings, TM2, TM5 and TM10 have been shown only by showing the main circuit and start circuits and one key but it will be understood that these machines are equipped with a plurality of keys and other instrumentalities as set out in the above Black patents.

Figure 3, above the dotted line, shows the relays and counter comprising an individual adding machine for the first runner and below the line a similar set of equipment for the last runner. It will be understood that in an installation there will be a number of individual adding machines corresponding to the number of keys on the ticket machines. If desired, each of these individual adding machines may be a complete unit such as the total adding machine shown in Figure 1, however, for the sake of simplicity, I prefer to separate from the individual adding machines as much as possible of the control equipment and to make such equipment common to all of the machines of the group which common equipment is shown in Figure 4 of the drawings. This can be safely done since the individual adding machines are operated one at a time, during which operation a particular machine has exclusive use of the common apparatus.

Associated with each individual adding machine is a scratch key, such as the keys 331 and 332, these keys being operated to open the circuit to the bet accepting relays, such as 31 and 36, when the particular individual runner corresponding to the adding machine is scratched. For convenience, keys 331 and 332 are designated as scratch keys. A reset key 302 is also provided and is adapted to be operated prior to preparing the system for use so as to insure that all relays in the individual adding machines will be in normal position.

Associated with the devices shown in the drawings are the usual supervisory alarm devices. However, since these devices form no essential part of the present invention, they have been omitted to avoid unnecessary complication of the drawings.

As shown in the drawings, the system employs the fundamental operating principles of the copending Levy application, Serial No. 100,464, filed September 12, 1936, now Patent 2,182,875, issued December 12, 1939, in that the collector is interposed between the total adding machine and ticket machines with its wiper connected to the bet accepting relay of the total adding machine. The individual runner keys of the ticket machines are multipled together and a circuit extended therethrough to the bet accepting relay of the individual adding machines. A fundamental operating circuit is extended through the bet accepting relay of the total adding machine and control relay of the ticket machine and the bet accepting relay of the individual adding machines in series, the adding machine relays operating at once over this circuit and the ticket machine relay remaining inactive until a checking circuit has been established. While this preferred form is shown, the teachings of the instant invention may be used in connection with other fundamental operating circuits, if desired.

In the operation of the system, after the sale of tickets has been completed, the counters of the individual adding machines are read to ascertain the total number of $2.00 tickets sold on that particular runner. To ascertain the $1.00

value of the tickets sold, the reading is multiplied by two. If the $1.00 lamp is lighted to indicate an odd dollar sale stored in the equipment, $1.00 is added to this sum. The total adding machine register is read in the same manner. Preferably, the counters are all restored to zero prior to the recondi.oning of the system for the registering of further ticket sales.

Referring now to the drawings in more detail, a detailed description of the operation of the system will be given.

The totalizer is made ready for betting by closing key 201 to connect the total adding machine bet accepting relay 10 to the collector, by closing key 205 to place starting ground upon the ticket machines, and by closing scratch keys such as 331 and 332 for each runner in the race to place the runner adding machine individual to the runner in condition to register bets on that runner. Other main control keys are operated to condition the supervisory equipment, but since this supervisory equipment forms no part of the present invention, it has been omitted from the drawings to avoid unnecessary complications thereof.

Assume that the first bet that the system is called upon to handle is placed on ticket machine TM1 and that it is placed upon runner number 1. Since the ticket machine TM1 is the first ticket machine in the $1.00 group, the amount bet is assumed to be $1.00 and the operation is as follows:

First $1.00 Bet

The ticket seller depresses key 210 in the ticket machine TM1 to prepare the machine for the issuance of a ticket upon runner number 1. Responsive to this operation, a starting circuit is closed as follows:

From ground through closed springs 205 of the start key, start conductor 262, key spring 211 and its make contact, through the ticket machine start multiple 260, through spring 209 and its break contact, start conductor 252, through spring 152 and its break contact, conductor 253, through the break contact of and spring 223 on the collector motor magnet 21, through the winding of that magnet to battery. Motor magnet 21 operates over this circuit preparatory to advancing the wipers 202, 203 and 204 one step, breaks its own circuit by opening springs 223 and advances the wipers upon restoring to normal. Magnet 21 operates in a buzzer-like fashion to advance the wipers step by step until they are in the position in which they are shown in Figure 2.

A circuit may now be traced from ground through relay 10, key springs 201, wiper 202 and its bank contact to which conductor 250 is connected, conductor 250, through break contact of and spring 206 of the ticket machine control relay 22, conductor 256, through ticket machine key spring 210 and its make contact, conductor 257, through key 331, through the winding of runner bet accepting relay 31 to battery. Relays 10 and 31 are high speed, high sensitivity relays and operate over this circuit. Relay 22 is a low sensitivity marginal relay and will not operate in series with relays 10 and 31. The operation of relay 10 opens springs 152 thereby to break the start circuit to stop the collector and thereby maintain the foregoing circuit intact.

Storing the bet in the runner adding machine

The operation of relay 31 closes a circuit from ground through spring 331 and its make contact, through the runner slave relay 32 to battery, operating relay 32. Relay 32 carries a group of springs which insofar as the operation of the circuits is concerned could be carried by relay 31, however, this relay would be overloaded and consequently would operate slower if it carried this spring load and, therefore, I prefer to use the slave relay 32.

Collector wipers 203 and 204 are aligned with wiper 202 and are now engaging one of a series of multiple contacts corresponding to the $1.00 ticket machines, and upon the operation of relay 10 a circuit is closed from ground, through spring 153 and its make contact, conductor 254, wiper 203 and its bank contact, conductor 268, through the winding of the $1.00 selective control relay 41 in the runner adding machine control unit, Figure 4, to battery. Relay 41 energizes over this circuit and at springs 423 closes a bet registering circuit as follows:

From ground through spring 423 and its make contact, conductor 357, spring 305 and its make contact, conductor 351, through make before break spring 303 and its break contact, through the upper winding of differential relay 33 to battery, with a branch circuit extending through the upper winding of differential relay 34 to battery, with a second branch circuit extending through spring 308 and its break contact through the lower winding of relay 34 to battery. Differential relay 33 operates over this circuit since it is energized only through its upper winding but relay 34 remains in normal position since both its upper and lower windings are energized.

Relay 33 locks itself in operated position from ground through reset key 302, through the make contact of springs 303, through the upper winding of relay 33 to battery. The operation of make before break spring 303 transfers the circuit through the upper winding of relay 34 from conductor 351 to grounded reset conductor 350, without particular effect at the moment. A circuit may now be traced from ground through spring 309 and its break contact, through spring 303 and its make contact, conductor 352, through spring 307 and its make contact, conductor 358, through the winding of relay 44 of the runner adding machine common control unit, to battery. Relay 44 operates over this circuit.

A circuit may now be traced from ground through spring 423 and its make contact, conductor 435, spring 435 and its make contact, to the one dollar bet acknowledging conductor 138 leading to the total adding machine. However, at the moment this circuit is deemed to be incomplete.

Storing $1.00 bet in total adding machine

In the total adding machine the operation of relay 10 also closes a circuit from ground through spring 154 and its make contact, conductor 256, wiper 204 and its bank contact to which conductor 131 is connected, through the winding of the total adding machine $1.00 selective control relay 3 to battery. Relay 3 operates over this circuit. A circuit may now be traced from ground through spring 139 of relay 6 and its make contact, conductor 163, through break contact of and make before break spring 102, through the upper winding of differential relay 01 to battery, with a branch extending through the upper winding of differential relay 02 to battery, and a second branch extending through conductor 134, spring 107 and its break contact.

through the lower winding of relay O2 to battery. Relay O1 operates over this circuit since it is energized only through its upper winding but relay O2 does not operate since it is energized through both its windings. Relay O1 upon operating locks itself to ground through reset key 155, through make contact of and spring 102, through the upper winding of relay O1 to battery. Operation of relay O1 transfers the circuit through the upper winding of relay O2 from ground on conductor 163 to ground on reset key 155, without particular effect at the moment.

Acknowledging the $1.00 bet

The operation of relay O1 having been thus completed, and relay 33 having been previously operated as explained above, the grounded acknowledging circuit previously traced to conductor 135 is extended through conductor 130, Figure 1, through spring 156 and its make contact, spring 157 and its break contact, acknowledging conductor 174, through resistance 158, to the previously traced circuit through relays 10, 22 and 31. Resistance 158 is thereby connected in parallel with relay 10, and the current flowing through the relay 22 is increased sufficiently to cause that relay to operate.

The operation of relay 22 closes spring 207, thereby to extend a circuit from battery through the lower winding of relay 22 to the grounded ticket machine start conductor 260 to lock relay 22 in its energized position. Relay 22 at spring 208 also closes a circuit for the motor of the ticket machine to operate that machine to print and issue a ticket and at the end of that operation to unlock key 210 to permit it to restore to normal.

The operation of relay 22 also opens springs 209 to open a point in the start circuit of the collector motor magnet 21 which operation is without effect at the moment since that circuit is held open by spring 152 of relay 10.

The operation of relay 22 also opens springs 206 thereby to break the circuit through relay 10, the upper winding of relay 22 and relay 31, and relays 10 and 31 restore to normal.

Clearing the runner adding machine

In the runner adding machine, restoration of relay 31 restores relay 32, thereby opening springs 305 to remove ground from the circuit extending from conductor 351 through spring 306 and its break contact, through the lower winding of relay 34, whereupon relay 34 operates over the previously traced circuit through its upper winding. Operation of relay 34 closes a circuit from ground through spring 304 and its make contact, conductor 356, through the $1.00 lamp to battery, lighting that lamp to indicate that there is a $1.00 bet stored on runner number 1. At springs 309, relay 34 opens the previously traced circuit through relay 44, this circuit having also been opened at springs 207, to permit relay 44 to restore. Restoration of relay 44 removes ground from $1.00 bet acknowledging conductor 135.

Thus it will be seen that the first $1.00 sale placed in the runner adding machines operates relay 33 and then relay 34 to store the sale, which is indicated by lighting the $1.00 lamp. Relays 33 and 34 may be termed either storing relays or accumulating relays, as desired. These relays store odd dollar sales, accumulating the same until the value that is registered on the counter is reached. If at the close of a sales period the sum in the adding machine is of an odd dollar value, the only indication of the odd dollar is in the operation of relay 34 and the lighting of the $1.00 lamp.

Clearing the total adding machine

Restoration of total adding machine bet accepting relay 10, at springs 154 opens the previously traced circuit for relay 6, permitting that relay to restore. Restoration of relay 6 opens springs 139 to remove ground from the previously traced circuit extending through conductor 164 and spring 107 and its break contact to the lower winding of relay O2, whereupon relay O2 operates over the previously traced circuit from reset key 155 through its upper winding. A circuit may now be traced from ground through spring 103 and its make contact through the $1.00 lamp of the total adding machinery to battery, that lamp burning to indicate that a $1.00 bet has been storing in the total adding machine.

Restoration of relay 10 at springs 153 opens the previously traced circuit for relay 41 of the runner adding machine control, permitting that relay to restore and thereby return the control to its normal position. Restoration of relay 10 recloses springs 152 to prepare the start circuit for the next operation of the equipment. This completes the registering of a $1.00 bet upon runner number 1 in the runner adding machine and in the total adding machine and the equipment is all in normal position in readiness for placing the next bet. Relays O1 and O2 like relays 33 and 34 may be called either storing relays or accumulating relays, as desired. Their function is identical with the function of relays 33 and 34 in that relays O1 and O2 are operated to store an odd dollar sale in the total adding machine and to control the $1.00 lamp which burns to indicate that there is an odd dollar sum stored in the total adding machine.

SECOND $1.00 BET ON RUNNER NUMBER 1

Assume that the second bet placed in the system is also placed upon runner number 1 and that it is a $1.00 bet. Under these conditions, the collector wipers will be located in the position in which they are shown and as soon as the runner number 1 key 210 in the ticket machine is closed, relays 10 and 31 will be energized. Relay 32 will energize with relay 31 and relay 41 in the runner adding machine control and relay 6 in the total adding machine will be energized over the previously traced circuits. The previously traced circuit extending ground over conductor 357 through spring 305 and its make contact will again be closed and will extend over conductor 351, through spring 306 and its make contact, through the lower winding of differential relay 33 to battery. Since relay 33 has been held in its operated position over a circuit extending through its upper winding, and both windings are now energized, and the relay will restore to normal. Restoration of relay 33 transfers the circuit through the upper winding of relay 34 from ground at reset key 302 to conductor 351 without effect at the moment since there is a ground on conductor 351, relay 34 remains operated and the runner No. 1 indicator lamp remains lighted.

A circuit may now be traced from ground through spring 422 of the selective control relay 41 and its make contact, conductor 353, through spring 316 and its make contact, conductor 355, spring 314 and its break contact, spring 315 and its make contact, through the winding of motor magnet 35 to battery. Motor magnet 35 operates

and through its armature 310 advances the counter one step.

An acknowledging circuit may now be traced from ground through spring 312 of the motor magnet 35 and its make contact, conductor 353, spring 311 and its make contact, conductor 359, spring 425 of control relay 41 and its make contact, to the $1.00 bet acknowledging conductor 185.

Registering the second $1.00 bet in the total adding machine

In the total adding machine, the energization of relay 6 as above explained again closes the circuit extended through conductors 163 and 164, through spring 107, and its make contact, through the lower winding of relay O1 to battery, and since relay O1 is maintained operated through a circuit through its upper winding, both windings will be energized and the relay will restore to normal. Restoration of relay O1 transfers the circuit through the upper winding of relay O2 from ground through reset key 155 to conductor 1[illegible] but relay O2 remains in operated position since, at the moment, there is a ground on conductor 163. A circuit may now be traced from ground, through spring 116 and its make contact, through spring 117 and its break contact, through spring 118 and its make contact, conductor 162, through the winding of motor magnet 11 to battery. Magnet 11 operates over this circuit and operates the counter one step.

The registration of the second $1.00 bet in the runner adding machine and in the total adding machine having now been completed, the ground upon the acknowledging conductor 135 is extended through spring 145 and its make contact, conductor 160, through spring 101 of motor magnet 11 and its make contact, conductor 161, through spring 123 of relay 6 and its make contact, acknowledging conductor 174, through resistance 153 to the previously traced circuit, through relays 10, 22 and 31, whereupon relay 22 operates as previously described to initiate the operation of the ticket machine and to break the above circuit at springs 206 to permit relays 10 and 31 to restore.

Clearing the runner adding machine

Restoration of relay 31 restores relay 32, whereupon springs 305 are opened and ground is removed from the previously traced locking circuit through the upper winding of relay 34 to permit that relay to restore.

Restoration of relays 32 and 34 breaks the previously traced circuit through motor magnet 35 to permit that magnet to restore to normal, thereby to complete the operation of the runner adding machine under the conditions assumed.

Clearing the total adding machine

Restoration of total adding machine relay 10 at springs 153 opens the circuit of runner adding machine control relay 41 to permit that relay and the control unit to restore to normal. At springs 154 relay 10 opens the previously traced circuit for relay 6, permitting that relay to restore and at springs 139 remove ground from the circuit through the upper winding of relay O2, thereby to permit that relay to restore. Restoration of relay 6 and O2 at springs 116 and 113 break the circuit through the winding of motor magnet 11 of the register to restore that unit to normal, thereby to complete the operation of the total adding machine under the conditions assumed. Restoration of relay 10 also closes springs 152 to prepare the collector start circuit for the next operation.

PLACING A $2.00 BET

Assume now that a bet is placed through ticket machine TM2, Figure 2, and that this ticket machine is one of the group of ticket machines that issues $2.00 tickets. Assume further that the bet is also placed upon runner number 1. Under these conditions, the ticket seller will depress the ticket machine key 219, thereby to close the starting circuit from grounded start conductor 252 and through spring 220 and its make contact, ticket machine start multiple 205, spring 218 and its break contact, start conductor 252 over the previously traced circuit to motor magnet 21 of the collector, causing the collector to operate step by step until wiper 202 is moved into engagement with the bank contact to which conductor 251 is connected, at which time the betting circuit is closed from ground through relay 10 and wiper 202, conductor 251, through spring 216 and its break contact, through the upper winding of relay 23, conductor 291, key spring 219 and its make contact, conductor 203, multiple conductor 264 to conductor 257, through scratch key 331, through the winding of relay 31 to battery. Relays 10 and 31 operate over this circuit as before, and relay 32 operates under the control of relay 31.

Registering the bet in the runner adding machine

At the time that wiper 202 engages the contact to which conductor 251 is connected, wiper 203 will be in engagement with a contact of the group to which conductor 269 is connected. The operation of relay 10 breaks the starting circuit at spring 152 to maintain the wipers fixed in this position and a circuit may now be traced from ground through spring 153 and its make contact, conductor 254, wiper 203 and its bank contact, conductor 269 through the winding of runner adding machine selective control relay 42 to battery, relay 42 operating over this circuit. A circuit may now be traced from ground through spring 412 on the relay 32 and its make contact, conductor 361, spring 313 and its make contact, conductor 354, through the winding of motor magnet 35 to battery, magnet 35 operating over this circuit to operate the counter one step, thereby to register the placing of the $2.00 bet. The operation of motor magnet 35 closes a point in the acknowledging circuit by extending a circuit from ground, through spring 312 and its make contact, conductor 353, spring 311 and its make contact, conductor 359, spring 425 and its break contact, conductor 464, spring 427 and its make contact, to $2.00 acknowledging conductor 186.

Registering the bet in the total adding machine

The operation of relay 10 also closes a circuit from ground through spring 154 and its make contact, conductor 255, wiper 204 and its bank contact to which conductor 132 is connected, conductor 182 through the winding of total adding machine selective control relay 7 to battery, operating this relay.

The operation of relay 7, at spring 126 closes a circuit from ground, through the make contact of that spring, through conductor 162, through the winding of motor magnet 11 of the total add-

ing machine counter, this magnet operating to operate the counter and thereby register the $2.00 bet. The checking circuit ground previously placed on conductor 136 now extends over a circuit through spring 146 of relay 7 and its make contact, conductor 160, through spring 101 of magnet 11 and its make contact, conductor 161, spring 129 and its break contact, through spring 133 and its make contact, through conductor 174, through resistance 158 to the previously traced circuit through relays 10, 23, and 31, whereupon relay 23 operates to operate the ticket machine to print and issue a ticket, as before. Relay 23 opens the circuit through relays 10 and 31, whereupon relay 10 falls back and opens springs 153 and 154 to open the previously traced circuits through relays 42 and 7, and relay 31 falls back to restore relay 32. The previously traced circuit through the motor magnet 35 is broken by the restoration of relays 42 and 32 whereupon that magnet restores and the springs 312 open the acknowledging circuit to restore the runner adding machine to normal and thereby complete the registering of the $2.00 bet therein.

Restoration of relay 7 breaks the previously traced circuit through the motor magnet 11, thereby to restore that magnet to normal to complete the registration of the bet in the total adding machine, and at springs 101, magnet 11 breaks a point in the acknowledging circuit, that circuit likewise being opened by the restoration of springs 146 of the relay 7. The $2.00 bet having thus been registered in the total adding machine and in the individual runner adding machine and the equipment restored to normal, the system is then ready for the accepting of another bet.

Placing a $5.00 Bet

As has been previously pointed out, the register mechanism of the runner adding machine and the register mechanism of the total adding machine are each operated once for each $2.00 bet received. When a $5.00 bet is placed, these registers must, therefore, be operated twice and in addition $1.00 of the $5.00 must be stored in the $1.00 bet storing mechanism. This gives rise to two operating conditions, the one occurring when a $5.00 bet is received at a time when there is no $1.00 bet stored in the mechanism and the other condition arising when a $5.00 bet is received at a time when there is a $1.00 bet stored in the register mechanism.

First we shall consider the former condition, that is, a $5.00 bet received where there are no $1.00 bets stored.

Ticket machine TM5 is one of a group of ticket machines issuing $5.00 tickets and for convenience we will assume that the $5.00 bet is placed on runner number one. Ticket machine key 224 is operated to select runner number one and start ground conductor 252 is extended through spring 225 and its make contact, thence through spring 223 and its break contact to start conductor 252, whereupon the motor magnet 21 of the collector operates to advance the wipers until wiper 202 engages the contact with which conductor 272 is connected. The bet accepting circuit is then extended from ground through relay 10 and wiper 202 as before and conductor 272, spring 230 and its break contact, through the upper winding of relay 24, spring 224 and its make contact, multiple conductor 264, conductor 257, through the winding of relay 31 to battery. Relays 10, 31 and 32 operate over this circuit as before.

Registering the bet in the runner adding machine

The operation of relay 10 at springs 133 closes a circuit from ground through conductor 254 and collector wiper 203 now engaged with a contact to which conductor 270 is connected, the circuit extending over that conductor through the winding of $5.00 selective control relay 43 in the runner adding machine control unit to battery. This relay operates over this circuit and the springs 424 closes a circuit from ground through the make contact of that spring to conductor 357 thence through make contacts 305 of relay 32, that relay having been operated as before, to relays 33 and 34 to energize relay 34 through both its windings and to energize relay 33 through its upper winding only, whereupon relay 33 operates. Operation of relay 33 transfers the previously traced circuits through the upper windings of relays 33 and 34 from grounded conductor 351 to reset conductor 350 without effect at the moment since this latter conductor is also grounded. A circuit is now extended from ground through spring 309 and its break contact, spring 308 and its make contact, conductor 352, through spring 307 and its make contact, conductor 358, through the winding of relay 44 to battery. Relay 44 operates over this circuit, without effect at the moment. Relays 45, 47, 48, 49 and 50 of the common control equipment, Figure 4, function to generate and count impulses delivered to the motor magnets, such as 35 or 40 of the counters in the individual adding machines. The number of pulses so generated and delivered depends upon which one of the selective control relays 41–45 inclusive is operated to initiate the operation of relays 45–50, inclusive, as will hereinafter appear. Relays 46–50, which may be called impulsing or control relays, in registering a $5.00 bet, function to operate the motor magnet of the counter twice.

The operation of relay 43 also closes a circuit from ground through spring 413 and its make contact, conductor 451, through spring 417 and its break contact, spring 419 and its break contact, conductor 450, spring 420 and its break contact, conductor 351, spring 313 and its make contact, conductor 354, through the winding of motor magnet 35 to battery, operating the motor magnet to thereby operate the counter one step.

The operation of motor magnet 35 closes a circuit from ground through spring 312 and its make contact, conductor 353, spring 311 and its make contact, conductor 359, spring 423 and its break contact, conductor 454, spring 427 and its break contact, conductor 453, thence through parallel paths, the one extending through spring 406 and its break contact, through the lower winding of differential relay 48 to battery and the other extending through main spring 405 and its break contact, thence through parallel paths the one through the upper winding of differential relay 47 to battery and the other through the upper winding of differential relay 48 to battery. Relay 47 operates over this circuit but relay 48 does not since it is energized through both of its windings.

Relay 43 also closes a circuit from ground through spring 433 and its make contact, conductor 457, thence through parallel paths through springs 435 and 436 and their respective break contacts, conductor 456, through the make contact of make before break spring 405, through the previously traced circuits through the upper

winding of relays 47 and 48. Relay 47 is thus locked in energized position to the ground on conductor 456 and the upper winding of relay 48 is energized over a different circuit than the lower winding, without effect at the moment. The operation of relay 47, at springs 417, opens the previously traced circuit for the motor magnet 35, whereupon the motor magnet de-energizes to advance the counter one step to register $2.00 of the bet and to open springs 312 and thereby break the previously traced circuit from ground to conductor 459. Relay 48 being no longer energized through its lower winding but being energized from ground on conductor 456, through its upper winding, operates.

The operation of relay 48, at spring 418 and its make contact, closes a circuit from ground through spring 413 and its make contact, conductor 451, conductor 463, through the make contact of and spring 410, through spring 419 and its break contact, conductor 450, spring 420 and its break contact and thence over the previously traced circuit through conductor 361, through the motor magnet 35, whereupon the motor magnet again operates and re-applies ground through springs 312 to the conductor 459 over the previously traced circuit, that ground now extending the circuit through spring 406 and its make contact, through the lower winding of relay 47 to battery. Relay 47 now being energized through both of its windings restores to normal. A circuit may now be traced from ground through spring 403 and its break contact, spring 409 and its make contact, through the winding of relay 49 to battery, relay 49 operating over this circuit and locking itself through spring 407 and its make contact, to grounded conductor 456.

The operation of relay 49 moves spring 419 away from its break contact, thereby to open the previously traced circuit for motor magnet 35, causing that magnet to restore and operate the counter for a second time and to open springs 312 to remove ground from conductor 459. Relay 48 restores when ground is removed from conductor 459 without effect. The circuit through conductor 361 is opened at springs 413 and remains open so that motor magnet 35 is not again operated and the registration of the second $2.00 part of the $5.00 bet is thus completed.

The operation of relay 49 extends an acknowledging circuit from ground through spring 441, and its make contact, conductor 460, spring 431 and its make contact, relay 44 having been operated as above explained, spring 429 and its make contact to the $5.00 acknowledging conductor 187.

Registering the $5.00 bet in the total adding machine

The operation of relay 10 as above explained extends a circuit from ground, through spring 154 and its make contact, wiper 204 now engaging the contact to which conductor 133 is connected, through winding of $5.00 selective control relay 8, to battery, operating that relay.

The operation of relay 8 closes a circuit from ground, through spring 140 and its make contact, conductor 163, thence over parallel paths, the one extending through conductor 164, spring 107 and its break contact through the lower winding of relay O2 to battery, and the other extending through the break contact of and the main spring 102, thence over parallel paths, the one through the upper winding of relay O1 to battery, and the other through the upper winding relay O2 to battery.

Relay O1 operates over this circuit and locks itself through spring 102 and its make contact to ground on the reset key 155. Relay O2 being energized through both of its windings, does not operate at the moment. Relay O1 on operating transfers the circuit just traced through the upper winding of relay O2 to ground at key 155, without effect at the moment. Relays 1 to 5 inclusive of the total adding machine function to generate and count impulses delivered to the motor magnet 11 of the register in the total adding machine. The number of pulses so generated and delivered depends upon which one of the selective control relays 5 to 9 inclusive is operated to initiate the operation of relays 1 to 5 inclusive, as will presently appear. Relays 1 to 5, which may be called either impulsing or control relays in registering a $5.00 bet in the total adding machine under the conditions assumed, function to operate the motor magnet twice.

The operation of relay 8 also closes a circuit from ground, through spring 127 and its make contact, spring 119 and its break contact, spring 121 and its break contact, spring 122 and its break contact, conductor 162, through the winding of motor magnet 11 to battery, operating the motor magnet 11. At spring 101, magnet 11 closes a circuit which may be traced from ground, through spring 147 of the relay 8 and its make contact, conductor 160, spring 101 and its make contact, conductor 161, spring 129 and its break contact, spring 133 and its break contact, conductor 177, thence over parallel paths, the one extending through spring 103 and its break contact through the lower winding of differential relay 2 to battery, and the other, through the break contact of and main spring 103 thence through parallel paths, the one through the upper winding of relay 1 to battery and the other through the upper winding of relay 2 to battery.

Relay 1 operates over this circuit but relay 2, being differentially wound and being energized through both of its windings, does not operate. Relay 8 also closes a circuit from ground through spring 141 and its make contact, conductor 178, thence over parallel paths through springs 143 and 144 and their respective break contacts to conductor 171, through make contact of and spring 103, through the upper windings of relays 1 and 2 to battery, relay 1 being locked in operated position over this circuit. The circuit through the upper winding of relay 2 is thus transferred from ground on conductor 137 to ground on conductor 171, without effect at the moment.

The operation of relay 1 opens spring 119 from its break contact, thereby to break the previously traced circuit through conductor 162 to the motor magnet 11, whereupon that magnet restores to advance the counter one step and to removed ground from conductor 177 by opening springs 101.

Relay 2, being no longer energized through both its windings operates over its upper winding. The circuit for motor magnet 11 is thereupon closed for a second time from ground through spring 127 and its make contact, conductor 165, spring 120 and its make contact, conductor 166 and thence over the previously traced circuit to the magnet which is again operated and again closes spring 101 to re-apply ground to conductor 177. This grounded cir-

cuit is now extended through spring 109 and its make contact, through the lower winding of relay 1 to energize that winding, and since the upper winding is already energized, relay 1 restores it to normal position.

A circuit may now be traced from ground, through spring 112 of relay 1 and its break contact, spring 113 and its make contact, through the winding of relay 3 to battery, relay 3 operating over this circuit and locking itself to grounded conductor 171 through springs 110.

The operation of relay 3 at springs 121 opens the previously traced circuit for the magnet 11, causing that magnet to restore and operate the counter for a second time and to break the previously traced circuit to conductor 177 by opening springs 101, and relay 2 falls back. The circuit for motor magnet 11 is held open at springs 121 and the magnet is not again operated.

The register having been operated twice and the $1.00 having been registered in the relays, a checking circuit may now be traced from ground on conductor 137, through spring 131 and its make contact, conductor 172, spring 130 and its make contact, conductor 175, spring 134 and its make contact, conductor 174 through resistance 153 to the previously traced circuit through relays 10, 24, and 31, to operate the relay 24.

Restoring the runner adding machine

The operation of relay 24 starts the ticket machine TM5 functioning to print and issue a ticket and also the springs 230 break the previously traced circuit through relays 10 and 31 to permit those relays to restore. Restoration of relays 31 and 32 in the runner adding machine breaks the previously traced circuit from the ground on springs 424, through the lower winding of relay 34 to operate that relay over the circuit from ground through the reset key 302, through spring 303 and its make contact, through the upper winding of relay 34 to battery. Relay 34 upon operating at springs 304 closes a circuit through the $1.00 lamp, causing that lamp to indicate that a $1.00 bet is stored in the relay equipment. Relay 33 which is locked in operated position through its upper winding to ground on reset key 302, remains in operated position.

The de-energization of relay 10 opens the previously traced circuit for relay 43 by opening springs 153, thereby permitting that relay to restore. Restoration of relay 43 opens springs 433 to remove ground on conductor 456, thereby to permit relay 43 to restore. Restoration of relay 43 opens springs 441 to remove ground from the $5.00 bet accepting conductor 137.

Restoring the total adding machine

Restoration of relay 10 also opens springs 154 to open the previously traced circuit for relay 8 which restores and opens springs 141 to remove ground from locking conductor 171 to permit relay 3 to restore. Restoration of relay 3 also removes ground from conductor 163 thereby breaking the circuit through the lower winding of differential relay O2 to permit the relay to operate through its upper winding now grounded at spring 155. Relay O2 at springs 103 closes a circuit through the $1.00 lamp of the total adding machine, lighting that lamp to indicate the storing of $1.00 of the $5.00 bet in the total adding machine.

Restoration of relay 10 closes springs 152 to prepare the start circuit in readiness for the next operation. As soon as the ticket machine TM5 has completed the operation of issuing the ticket, it also restores to normal.

PLACING A SECOND $5.00 BET ON RUNNER ONE

Assume now that the next bet placed in the system is also a $5.00 bet upon runner number 1. Key 224 will again be depressed and the previously traced circuit for relays 10, 24 and 31 will be completed and those relays will be energized as before. Relay 10 will operate and close the previously traced circuits for relay 43 in the runner adding machine control and relay 8 in the total adding machine. The previously described circuits for sending two pulses to the motor magnet 35 of the register will be closed as before. However, since there is already a $1.00 bet stored in the relays 33 and 34 on the runner adding machine as indicated by the lighted condition of the $1.00 lamp and since there is an odd dollar in the $5.00 bet now being registered, and since the sum of these two $1.00 bets equals $2.00, the register must again be operated as follows:

Upon operating, relay 43 closes the previously traced circuit from ground through spring 424, conductor 357, spring 305 and its make contact, conductor 351, thence through spring 306 and its make contact, through the lower winding of relay 33 to battery. Relay 33 now being energized over both of its windings restores to its normal position and at spring 303 opens a second point in the circuit of relay 44 so that that relay remains in its normal position. Relay 43 having been energized to terminate the second impulse to the motor magnet 35 to permit that motor magnet to restore and relay 48 now being restored to its normal position at the end of the second pulse to the motor magnet 35 as explained above, a circuit may now be traced from ground, through spring 413 and its make contact, conductor 451, spring 417 and its break contact, spring 418 and its break contact, conductor 452, spring 415 of relay 44 and its break contact, conductor 453, spring 421 and its break contact, spring 420 and its break contact, thence over the previously traced circuit through conductor 351, through spring 313 and its make contact, and thence through the motor magnet 35 to battery, operating the motor magnet for a third time. Motor magnet 35 closes the previously traced circuit from ground, through springs 312 to the conductor 459, this circuit now extending through the upper winding of relay 47 to battery with branches extending through the upper and lower winding of relay 48 as before. Relay 47 operates over this circuit and closes a circuit from ground through spring 403 and its make contact, spring 410 and its break contact, spring 411 and its make contact, conductor 455, through the winding of relay 50 to battery, relay 50 operating and locking itself through springs 404 to conductor 454 which is grounded by springs 403 and 401. The operation of relay 50 breaks the circuit through motor magnet 35 at springs 428 to permit that motor magnet to fall back and complete the registration of the third $2.00 bet which as previously explained was composed of the $1.00 bet previously stored in the machine and the $1.00 from the $5.00 bet now being registered.

Operation of relay 50 closes a circuit from ground, through spring 442 and its make contact, conductor 461, spring 431 and its break contact,

spring 423 and its make contact to the $5.00 acknowledging conductor 137.

Registering the second $5.00 bet in the total adding machine

In the total adding machine, upon the energization of relay 3 at the beginning of the operation, springs 140 place a ground on conductor 163 thereby to energize both windings of relay O1, relay O2 having been locked in energized position at the completion of the storing of the $1.00 part of the previous $5.00 bet. Relay O1 restores to normal and relay O2 remains energized for the moment.

The motor magnet 11 is operated through two pulses in the manner explained in the previous $5.00 bet at the end of which relay 3 becomes energized to break the circuit of the magnet by opening springs 121 during the second of these two impulses and relays 1 and 2 are both restored to normal as before. Thus, at the completion of the second pulse to the register motor magnet 11, a circuit may be traced from ground through spring 127 of relay 8 and its make contact, conductor 165, spring 121 and its make contact, spring 120 and its break contact, conductor 169, spring 123 and its make contact, conductor 170, spring 123 and its break contact, spring 122 and its break contact, through conductor 162 over the previously traced circuit through the motor magnet 11 to battery. The motor magnet is operated for a third time over this circuit and ground is placed upon conductor 177 as before to energize both windings of relay 2 and one winding of relay 1, whereupon relay 1 operates. Relay 1 being operated and relay 2 being normal, a circuit may be traced from ground through spring 112 and its make contact, spring 114 and its break contact, spring 115 and its make contact, through the winding of relay 4 to battery, operating relay 4 which locks itself through spring 111 to ground at spring 106. At springs 122, relay 4 breaks the circuit of motor magnet 11 to permit that magnet to restore to normal and complete the registering of the third $2.00 bet.

Upon completion of this operation, the grounded circuit previously traced to conductor 137 from the runner adding machine control unit is extended through spring 132 and its make contact, conductor 173 through spring 139 and its break contact, conductor 175, spring 134 and its make contact, conductor 174, through resistance 138 to the previously traced circuit through relays 10, 21 and 31 and relay 24 operates over this circuit.

The operation of relay 24 breaks the circuit of relays 10 and 31 to permit those relays to restore to normal and in the runner adding machine, restoration of relay 31 restores relay 32. Relay 31 which has been locked in operated position through the break contact of spring 333 to conductor 331 is restored to normal by the opening of this locking circuit at springs 305, thereby to open the circuit through the $1.00 lamp.

Relay 43 which is locked in operated position to ground on conductor 468 is restored upon the de-energization of relay 43 and this relay in turn restores relay 60 to normal so that all of the counting relays in the runner adding machine control are back to normal.

In the total adding machine, restoration of relay 10 breaks the circuit of relay 8 of the total adding machine control to permit relay O2 and the control relays 1, 3 and 4 all to restore to normal in readiness for the next operation.

PLACING $10.00 BET

Ticket machine TM10 is one of the group arranged to print and issue $10.00 tickets and assume that TM10 is operated to place a $10.00 bet on runner number 1. This is done by closing ticket machine key 226 whereupon spring 227 extends start ground from conductor 262, through spring 229 and its break contact, to start conductor 252 to close the previously traced circuit of the motor magnet for the collector, causing that collector to operate buzzer-like fashion so as to bring wiper 202 into engagement with the contact to which conductor 273 is connected. The bet accepting circuit is closed as before through relays 10 and 31 extending this time through the upper winding of relay 25 of the ticket machine TM5 and the key 228 and its make contact. The operation of relay 31 operates its slave relay 32 as before and the operation of relay 10 opens the start circuit at springs 152 and closes springs 153 and 154 as before, spring 153 closing a circuit from ground through wiper 253 which now engages the contact to which conductor 271 is connected. This circuit is extended through relay 45 of the runner adding machine control to battery, to operate that relay.

Registering the bet in the runner adding machine

In order to register the $10.00 bet, it is necessary that the register motor magnet be energized five times, this being accomplished as follows:

The operation of relay 45 closes a circuit from ground, through spring 414 and its make contact, spring 417 and its break contact, spring 418 and its break contact, spring 419 and its make contact, conductor 453, through spring 421 and its break contact, spring 420 and its break contact to conductor 331 with a branch path extending from the break contact to spring 417, through the break contact of spring 419, to the break contact of spring 420. The previously traced circuit from conductor 331 through the motor magnet 35 is closed to operate that magnet. Spring 312 closes a circuit from ground over the previously traced circuit to conductor 459, thence over the previously traced parallel paths through the upper winding of relay 47 and the upper and lower windings of relay 43, to cause relay 47 to operate. Relay 45 placed ground upon conductor 433 by closing spring 434 so that relay 47 upon operating locks up to this conductor, and the circuit through the upper winding of relay 43 is transferred to conductor 433 as before. The energization of relay 47 breaks the circuit of the motor magnet 35 by opening springs 417, causing the motor magnet to restore and open springs 312 thereby to remove ground from conductor 459.

Relay 43 being no longer energized through both of its windings operates through its upper winding so that at the moment both relays 47 and 43 are in operated position. The first pulse to the motor magnet is thus completed.

The second pulse is transmitted upon the operation of relay 43 by spring 413 moving into engagement with its make contact, ground being now placed on the conductor 331 from grounded conductor 451, through spring 418 and its make contact, spring 413 and its break contact and spring 420 and its break contact. The motor magnet is energized for a second time and again

closes springs 312 to re-apply ground to conductor 459, whereupon relay 47 becomes energized through its lower, as well as its upper winding, and restores to its normal position. Restoration of relay 47 transfers the circuit through the upper winding of relay 48 back to conductor 459 without effect at the moment since there is a ground on that conductor.

A circuit may now be traced from ground through spring 408 and its break contact, spring 409 and its make contact, through the winding of relay 49 to battery, operating that relay which locks through its spring 407 and its make contact to grounded conductor 456. Relay 49 upon operating opens the circuit of motor magnet 35 by moving spring 419 from its break to its make contact, whereupon motor magnet 35 falls back to complete the second pulse and to open spring 312. This removes ground from conductor 459 thereby permitting relay 48 to restore to its normal position.

The circuit of motor magnet 35 is closed for a third time from grounded conductor 451 through spring 417 and its break contact, spring 413 and its break contact, conductor 452, spring 416 and its make contact, conductor 453, spring 421 and its break contact, spring 420 and its break contact to conductor 351, the motor magnet operating and again closing spring 312 to re-apply ground to conductor 459 thereby to energize relay 47 through its upper winding and relay 48 through both of its windings, to cause relay 47 to operate. On operating relay 47 transfer the circuit through the upper winding of relay 48 to conductor 456 without effect. Relay 47 upon operating breaks the circuit of the motor magnet 35 by opening springs 417, whereupon the motor magnet restores to end the third pulse and opens springs 312. Relay 47 upon operating also closes circuit from ground through spring 403 and its make contact, spring 410 and its break contact, spring 411 and its make contact through the winding of relay 50 to battery, energizing relay 50 at the springs 420, opens another point in the circuit of motor magnet 35. Relay 50 locks through springs 404 to grounded conductor 454. The energization of relay 50 also opens, at spring 435, a point in the circuit over which ground is placed on locking conductor 456 and at springs 438 closes a circuit which may be traced from ground through spring 430 of relay 45 through conductor 458, springs 438 and its make contact, through the winding of relay 46 to battery, relay 46 operating over this circuit and locking itself to conductor 453 through springs 437.

Relay 46 also opens springs 436 thereby to remove ground from conductor 455 to permit relay 47 and relay 49 to restore to normal. Relay 48 already being at normal, ground is removed from conductor 454 to permit relay 50 to restore to normal.

The circuit of the motor magnet is closed for the fourth pulse over a circuit from grounded conductor 451, through spring 417 and its break contact, spring 413 and its break contact, spring 420 and its break contact to conductor 351, the magnet 35 operating to close springs 312 and again apply a ground upon conductor 459 to complete the parallel circuits through the upper winding of relay 47 and both windings of relay 48, thereby to operate relay 47 which transfers the upper winding of relay 48 to grounded conductor 456 and breaks the circuit of the motor magnet by opening springs 417, whereupon motor magnet 35 falls back to end the fourth pulse and to remove ground from conductor 459.

As soon as ground is removed from conductor 459, the circuit through the lower winding of relay 48 is broken, whereupon the relay operates through its upper winding. The circuit of motor magnet 35 is closed for the fifth time from ground conductor 451 through conductor 463, spring 418 and its make contact, spring 419 and its break contact, conductor 450, through spring 420 and its break contact, to conductor 351, motor magnet 35 operating and again closing spring 312 to re-apply ground to conductor 459, whereupon both windings of relay 47 become energized and that relay moves to its normal position. A circuit may now be traced from ground through spring 403 and its break contact, spring 409 and its make contact, through the winding of relay 49, that relay operating to open the circuit of the motor magnet 35 by moving spring 419 from its break to its make contact and to lock itself through spring 407 to conductor 456. The previously traced circuit over which the third impulse to the motor magnet was transmitted is now open at spring 421 on relay 5 so that no more pulses can be sent to the motor magnet and the registration of the $10.00 bet is therefore complete, the magnet having been operated five times.

An acknowledging circuit may now be traced from ground, through spring 439 and its break contact, spring 440 and its make contact, conductor 463, spring 443 and its make contact, conductor 462, spring 432 and its make contact to the $10.00 acknowledging conductor 188.

Registering the $10.00 bet in the total adding machine

In the total adding machine, the operation of relay 9 closes a circuit for the motor magnet 11 of the register which may be traced from ground, through spring 123 and its make contact, spring 119 and its break contact, spring 121 and its break contact, spring 122 and its break contact, conductor 162, through the winding of the magnet to battery. The magnet operates on this first pulse to close springs 101.

A circuit may now be traced from ground, through spring 149, conductor 160, spring 101 and its make contact, conductor 161, spring 129 and its break contact, spring 133 and its break contact, conductor 177, thence over parallel paths through the upper winding of relay 1 and the upper and lower windings of relay 2, relay 1 operates over this circuit and the springs 119 open the circuit of magnet 11 to permit that magnet to fall back, thereby to complete the first pulse.

Relay 9, at springs 142 closes a circuit from ground to conductor 173, the circuit extending therefrom through parallel paths through springs 143 and 144 to conductor 171. On operating, relay 1 locks itself through its upper winding and springs 103 to conductor 171 and at the same time transfers the circuit for the upper winding of relay 2 from conductor 177 to conductor 171, without effect at the moment since both conductors are grounded.

Opening the springs 101 removes ground from conductor 177, whereupon the circuit through the lower winding of relay 2 is broken and that relay operates over the circuit through its upper winding. The operation of relay 2 closes the previously traced circuit from ground to spring 128 through conductor 165, through the make contact of spring 120, through conductor 166 and

thence over the previously traced circuit through the motor magnet 11 to battery to operate that magnet for a second time.

Springs 101 re-apply ground to conductor 177 thereby to energize relay 1 through both of its windings to cause that relay to restore to normal. The circuit through the upper winding of relay 2 is transferred back to conductor 177 by springs 108, without effect at the moment. A circuit may now be traced from ground through spring 112 and its break contact, spring 113 and its make contact, through the winding of relay 3 to battery, operating relay 3 which locks through spring 110 to grounded conductor 171. Relay 3 opens spring 121 from its break contact thereby to break the circuit of motor magnet 11 to cause that motor magnet to fall back at the end of the second pulse, spring 101 removing ground from conductor 177. Relays 1 and 2 now being deenergized are both in normal position.

The circuit of motor magnet 11 is closed for a third time from ground on conductor 165, through spring 121 and its make contact, conductor 166, spring 120 in its break contact, spring 124 and its make contact, conductor 170, to spring 123 and its break contact over the previously traced circuit to the magnet. The magnet 11 operates for a third time and spring 101 again places ground upon conductor 177.

The grounded circuit through conductor 177 extends over the same parallel paths as for the first pulse, that is through the upper winding of relay 1 and through both windings of relay 2, operating relay 1 which transfers the circuit through the upper winding of relay 2 to conductor 171, without effect at the moment.

A circuit may be traced now from ground, through spring 112 and its make contact, spring 114 and its break contact, spring 115 and its make contact, through the winding of relay 4, relay 4 operating over this circuit and locking self in energized position to grounded conductor 160 through springs 111.

A circuit may now be traced from ground, through spring 143 and its make contact, conductor 179, spring 150 and its make contact through the winding of relay 5 to battery, operating the relay 5 which locks through spring 151 to grounded conductor 179.

Relays 4 and 5 now both being operated, springs 143 and 144 are both open so that ground is removed from conductor 171. The circuit of the motor magnet having been broken by the opening of springs 122 and relay 4 energized, the magnet is restored to end the third pulse and the springs 101 remove ground from conductor 177 so that relays 1, 2, 3 and 4 are all permitted to restore to their normal position.

The circuit of motor magnet 11 is closed for the fourth time over the same circuit as for the first pulse, and for a fifth time over the same circuit as the second pulse, the magnet is prevented from operating a sixth time since the circuit for the third pulse to the magnet is held open by springs 123 on the relay 5, and the registration of the $10.00 bet is, therefore completed.

The checking circuit ground on the $10.00 acknowledging conductor 188 is now extended from ground through spring 137 and its break contact, spring 138 and its make contact, spring 139 and its make contact, spring 135 and its make contact to conductor 174 through the resistance 158 to the previously traced bet accepting circuit through relays 10, 25 and 31. The relay 25 operates over this circuit to initiate the operation of the ticket machine TM5 and at springs 231 opens the circuit for relays 10 and 31 to permit them to restore to normal and thereby restore to normal the runner adding machine and the total adding machine in the hereinbefore explained manner.

In the foregoing description of the placing of a $1.00 bet, $2.00 bet, $5.00 bet and $10.00 bet, and registering the same in the total adding machine and individual runner adding machine corresponding to the selected runner, no mention has been made of the pool in which the bets have been placed. As is well understood by those skilled in the art, the totalizer equipment such as hereinbefore described is employed in triplicate, that is, a complete set of equipment for the win pool, a similar set of equipment for the place pool and a third set of equipment for the show pool. It also frequently happens that combination tickets are to be sold, that is, a single ticket is issued for three bets on a particular runner, one bet for that runner to win, a second bet for that runner to place and a third bet for that runner to show. In Figure 5, I have shown equipment for issuing and registering such combination tickets.

Assume now for the moment that the equipment shown in Figures 1 to 4 inclusive is in the win pool and that the combination tickets are for a $1.00 bet in each of the win, place and show pools, the operation of the system will be as follows:

In the combination group, there is provided a win group control, relay 51, a place bet group control, relay 52, and a show bet group control, relay 53, together with a master combination control relay 54. Ticket machines 56 and 57 are respectively the first and last ticket machines in the combination group, these ticket machines being identical with the others insofar as the electrical circuits are concerned. Each ticket machine is provided with a key for each runner, the key 501 of the first ticket being assumed to be the key for runner number 1 and key 502 the key for the last runner. Relay 58 is connected in circuit with the first runner keys such as 501 and 503 of all of the ticket machines in the group and relay 59 is connected in circuit with the last runner key such as 502 and 504 in all of the ticket machines of the group. It will be understood that additional keys and relays have been provided but these have been omitted from the drawings to avoid unnecessary complication thereof.

Placing a Combination Bet on Runner Number 1

Assume for the moment that ticket machine 56 is operated to place a combination bet on runner number 1. Key 501 will be depressed thereby to close a circuit from ground through spring 510 and its make contact, spring 511 and its break contact, spring 512 and its break contact, spring 513 and its break contact, through the winding of motor magnet 60 to battery, operating the motor magnet which breaks its own circuit by opening springs 513. Motor magnet operates in buzzer-like fashion to advance wiper 550 until that wiper engages the contact to which conductor 551 is connected at which time a circuit may be traced from ground through relay 61, wiper 550, conductor 551, spring 514 of relay 62 and its break contact, through the upper winding of relay 62, through key spring 501 and its make contact, conductor 552, through the winding of relay 58 to battery. Relay 61 operates over this circuit

BEST COPY AVAILABLE

and at spring 512 opens the circuit of the motor magnet 60 to bring the collector to rest. Relay 58 also operates over this circuit. However, ticket machine relay 62 does not operate at the moment.

The operation of relay 58 at springs 515 closes a circuit from ground through the winding of relay 54 to battery to operate relay 54. At springs 516, relay 58 closes a point in the bet accepting circuit of the win pool, that circuit being, at the moment, open elsewhere. At springs 517, relay 58 closes a point in the bet accepting relay of the place pool and at springs 518 a point in the bet accepting circuit of the show pool which circuits are likewise, at the moment, incomplete.

The operation of relay 54, at springs 519, closes a circuit which may be traced from ground through that spring and its make contact, spring 520 and its break contact, start conductor 252 of the win pool, spring 152 and its make contact of the bet accepting relay 10 in the total adding machine of the win pool, through spring 223 and the motor magnet 21 of the win pool collector to battery, operating that collector step by step until its wiper 202 engages the contact to which conductor 274 is connected. A circuit may now be traced from ground through relay 10 of the total adding machine, wiper 202, conductor 274, spring 526 and its make contact, through the upper winding of relay 51, through spring 521 and its break contact, spring 516 and its make contact, conductor 264, conductor 267, through the winding of relay 31 to battery. Relays 10 and 31 operate over this circuit but relay 51 does not operate.

At the time that wiper 202 engages the contact to which conductor 274 is connected, wiper 203 will be in engagement with the contact to which conductor 263 is connected and the previously traced circuit for relay 41 of the individual runner adding machine control will be closed and that relay will operate to cause the storing of a $1.00 bet in the individual runner adding machine number 1, that registration being accomplished in the hereinbefore explained manner. Wiper 204 will be in engagement with the contact to which conductor 231 is connected to close the previously traced circuit for relay 3 of the total adding machine, operating that relay to effect the storing of a $1.00 bet in the total adding machine. At the completion of this operation, the hereinbefore described checking circuit will be closed through resistance 158, whereupon relay 31 will operate and through spring 520 and its make contact lock itself in operated position through its lower winding to ground at spring 519.

Simultaneously with the foregoing operation, relay 54, upon operating, at springs 523 places ground on a circuit extending through springs 521 of relay 52 to the place pool start conductor 252a, thereby to close a circuit for the collector of the start pool which is exactly the same as that just described for the win pool. When that collector has selected the contact to which conductor corresponding to conductor 274 is connected, the bet accepting relay 10 of the place total adding machine will extend a circuit to conductor 274a, that circuit extending through spring 522 and its make contact, through the upper winding of relay 54, through spring 525 and its break contact, spring 517 and its make contact, and thence to conductor 264a which leads to the bet accepting relay of the number 1 runner in the place pool, which relay corresponds to relay 31. The $1.00 bet is thereupon stored in the individual runner adding machine and the total adding machine of the place pool in exactly the same manner as hereinbefore described, at the end of which operation the acknowledging circuit through resistance 158 of the total adding machine of the place pool increases the current flow to operate relay 52, which locks itself through its lower winding and spring 524 and its make contact to ground through spring 523.

Simultaneously with the foregoing operations, relay 54 at springs 527 extends start ground through spring 528 to start conductor 252b of the show pool, thereby to operate the collector of the show pool in the hereinbefore described manner to establish a circuit from the bet accepting relay 10 of the total adding machine of the show pool and conductor 274b through the upper winding of relay 53, spring 529 and its break contact, spring 518 and its make contact to conductor 264b leading to the bet accepting relay of the individual runner adding machine number 1 in the show pool, that relay corresponding also to relay 31. A $1.00 storing is thereupon made in the total adding machine and individual runner adding machine of the show pool in the hereinbefore described manner and at the end of the registration the current flowing in the circuit is increased to operate relay 53 which locks itself through its lower winding and spring 528 to ground at spring 527.

A circuit may now be traced from ground through resistance 530, through spring 531 of relay 51, spring 532 of relay 52, spring 533 of relay 53 and their respective make contacts through wiper 550, conductor 551, spring 514 and its break contact, thence over the previously traced circuit through the upper winding of relay 62 and relay 58 to battery. Relay 62 operates over this circuit to initiate the operation of the ticket machine to cause that machine to print and issue a ticket. Relay 62 upon operating opens at springs 514 the previously traced circuit for relay 58, whereupon that relay falls back and at springs 515 opens the previously traced circuit for relay 54 to permit that relay to restore. Restoration of relay 54 opens the locking circuits for relays 51, 52 and 53 to permit those relays to restore, thereby to restore the combination ticket group to normal in readiness for the next operation. As soon as the ticket machine 55 has completed its operation, spring 521 is restored as before.

As shown in Figure 5, the combination ticket machine group collector, including wiper 550, has access to five ticket machines, the first and last of which are shown. It will be understood that the other bank contacts over which wiper 550 passes will be multipled to give that wiper access to the five ticket machines in sequence. As shown in Figure 2, conductor 274 is connected only to one bank contact. It will be understood that this wiper may be multipled into other bank contacts so that the combination ticket machine group will be available to the wipers of the collectors more frequently.

From the foregoing it will be seen that the totalizer system of my invention is possessed of many advantages. Inexpensive counters are employed to register the sale of tickets, those counters being operated once or a plurality of times depending upon the value of the ticket sale being

BEST COPY AVAILABLE

registered. Each time the counter is operated a $2.00 sale is registered and lamp means are provided to indicate the presence of odd dollar sales in the equipment. The simple relatively inexpensive equipment employed permits the system to be used under conditions under which the larger systems of the prior art would be prohibitive in cost.

While I have chosen to show and describe a preferred embodiment of my invention, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a totalizer system, a total adding machine including a control means and an accepting relay, a plurality of ticket machines each arranged to print tickets of a particular value, a collector for extending a circuit from said accepting relay to said ticket machines one at a time, a plurality of individual adding machines each including an accepting relay, means in said ticket machines for extending said circuit from said total adding machine accepting relay to the accepting relay in one of said individual adding machines to operate said accepting relays, a control means common to said plurality of individual adding machines, means controlled by said operated individual adding machine accepting relay for connecting said common control means to said individual adding machine, means in said collector for extending a circuit from control means operated by said total adding machine relay to said common control means to operate said means to control said individual adding machine to register a value therein corresponding to the value of the tickets printed by the ticket machine to which the total adding machine is then connected, and means in said collector for extending a circuit from other means operated by total adding machine accepting relay to said total adding machine control means to operate said means to control said total adding machine to register the same value therein.

2. In a totalizer system, a plurality of individual runner adding machines, a pair of relays in each of said machines, a counter in each adding machine, electro-magnetic means for operating said counter, control relays common to said plurality of individual adding machines, means for selectively connecting said common control relays to said adding machines one at a time, and a circuit for the electromagnetic means of the adding machine to which said common control relays are connected, which circuit extends through contacts on the pair of relays in said adding machine and on said common control relays to operate said electro-magnetic means.

3. In a totalizer system, a total adding machine, a plurality of individual runner adding machines, an electro-magnetically operated counter in each of said individual runner adding machines and said total adding machine adapted to register two-unit values, accumulating relays in each of said adding machines adapted to store single-unit values, a ticket printing machine adapted to print five-unit value tickets, means for connecting together said total adding machine, said ticket machine and a selected one of said individual runner adding machines, and means for operating the counters of both the total and individual adding machines each twice and the accumulating relays of both the total and individual adding machines each once to register and store the five-unit value in said total and individual adding machines.

4. In a totalizer system an adding machine containing, a pair of relays for accumulating single-unit values, an electro-magnetically operated counter arranged to count two-unit values, relay means for controlling said counter, a five-unit value ticket machine, means for operating said ticket machine to establish a connection with said adding machine, means in said adding machine operated over said connection for actuating said relay means to operate said counter twice and to actuate one of said pair of accumulating relays to store a one-unit value, and means for controlling said relay means to operate said counter a third time when said one-unit value is added to a one-unit value previously stored in said pair of accummulating relays.

5. In a totalizer system, a counter, a motor magnet for said counter, a selective control relay for each value to be registered on said counter, a pair of pulsing relays, control relays, circuits for said control relays controlled by said pulsing relays, a circuit for said motor magnet extending through a chain of contacts controlled by said control relays, pulsing relays and selective control relays, an operating circuit for said pulsing relays controlled by said motor magnet and selective control relays, means for operating one of said selective control relays, and means including said chain circuits and said pulsing and control relays for operating said motor magnet the number of times necessary to register a number corresponding to said operated selective control relay.

6. In a totalizer system, an adding machine, a pair of differential relays and a control relay therein, a ticket machine, means for connecting said ticket machine to said adding machine, said means establishing a circuit over which said control relay is operated, means for preparing a circuit for said differential relays, means closed by said control relay in operated position for closing said circuit to energize both of the windings of one of said differential relays and one of the windings of the other one of said differential relays to operate the latter relay, means in said ticket machine for opening the circuit over which said control relay is operated to restore said relay, means for holding said operated differential relay in operated position and for operating the other differential relay upon the restoration of said control relay, and means controlled by said other differential relay in operated position for indicating an operation of said ticket machine.

7. In a totalizer system, a counter, a magnet for operating said counter, a control relay group, a pair of differentially wound relays included in said group, a circuit for said magnet extending through a chain of contacts in said control relay group, means for closing said circuit to operate said magnet, contact means closed by said magnet, circuit means controlled by said magnet contact means for energizing both windings of a second and one winding of a first one of said differentially wound relays to operate said first one of them, said first differential relay on operating locking itself and opening said magnet

circuit to permit the magnet to restore, said magnet upon restoring operating said magnet contact means to open the circuit through one winding of said second differential relay, said second differential relay operating to reestablish said magnet circuit to operate the magnet thereover, said magnet re-closing said magnet contact means to close a circuit through the second winding of said first differential relay to restore the first one of said differential relays, means controlled by said differential relays for operating the other relays of said control relay group in sequence to control the operations of said magnet, and means including a contact set in said chain of contacts controlled by the last operated of said control relays for opening said magnet circuit.

8. In a totalizer system, a total adding machine comprising a counter, storage relays, and an accepting relay, a plurality of ticket machines each arranged to print tickets of a value particular to that machine, collector means for extending a circuit from said adding machine accepting relay to said ticket machines one at a time, a plurality of individual adding machines each comprising a counter, accumulating relays and an accepting relay, means in each ticket machine for selectively extending said circuit from said total adding machine to one of said individual adding machines, control means for said total adding machine, control means common to said plurality of individual adding machines, means in said collector means for extending circuits to said total and common control means, means in said total adding machine control means actuated over said circuit from said collector means for operating that adding machine to register the value of the ticket printed by the ticket machine to which the total adding machine is then connected, and means in said common control means actuated over said circuit from said collector means for simultaneously operating the selected one of said individual adding machines to register the same ticket value therein.

9. In a totalizer system, a total adding machine comprising a counter, storage relays, and an accepting relay, a plurality of ticket machines each arranged to print tickets of a value particular to that machine, a collector for extending a circuit from said total adding machine accepting relay to said ticket machines one at a time, a plurality of individual adding machines each comprising a counter, accumulating relays and an accepting relay, means in each ticket machine for selectively extending said total adding machine accepting relay circuit to one of said individual adding machine accepting relays, control means for said total adding machine, a plurality of conductors leading into said control means, control means common to said plurality of individual adding machines, a plurality of conductors leading into said common control means, means in said collector for extending control circuits to said total and common control means over conductors corresponding to the ticket machine to which the total adding machine is connected, means in said total adding machine control means actuated over the control circuit thereto for operating that adding machine to register the value of the ticket printed by the ticket machine to which that adding machine is connected, means in said common control means actuated over the control circuit thereto for simultaneously operating the selected one of said individual adding machines to register the same ticket value therein, means in said common control means operated at the completion of the registering of said ticket value in said individual adding machine for extending a checking circuit through said total adding machine control means to said total adding machine and over said accepting relay circuit to said ticket machine, and means in said ticket machine operated over said checking circuit for operating the ticket machine to issue a ticket.

10. In a totalizer system, a total adding machine comprising a counter, storage relays, and an accepting relay, a plurality of ticket machines each arranged to print tickets of a value particular to that machine, a collector for extending a circuit from said total adding machine accepting relay to said ticket machines one at a time, a plurality of individual adding machines each comprising a counter, accumulating relays, and an accepting relay, means in each ticket machine for selectively extending said total adding machine accepting relay circuit to one of said individual adding machines, control means for said total adding machine, a plurality of conductors leading into said control means, control means common to said plurality of individual adding machines, a plurality of conductors leading into said common control means, means in said collector for extending control circuits to said total and common control means over conductors corresponding to the ticket machine to which the total adding machine is connected, means in said total adding machine control means actuated over the control circuit thereto for operating that adding machine to register the value of the ticket printed by the ticket machine to which that adding machine is connected, and means in said common control means actuated over the control circuit thereto for simultaneously operating the selected one of said individual adding machines to register the same ticket value therein.

11. In a totalizer system, a total adding machine comprising a counter, storage relays, and an accepting relay, a plurality of ticket machines divided into groups each group printing tickets of value different from the other groups, a control unit in said total adding machine, a control relay in said unit for each value of ticket, a plurality of individual adding machines each comprising a counter, accumulating relays and an accepting relay, a control unit common to said individual adding machines, a control relay in said common control unit for each value of ticket, a collector, means including said collector for establishing a circuit connection between said total adding machine accepting relay, a ticket machine and the accepting relay of one of said individual adding machines, means for operating a control unit relay in each unit corresponding to the value of ticket to be printed by said connected ticket machine, and means controlled by said operated control relays for operating said adding machines to register therein the value of the ticket printed by said ticket machine.

12. In combination, a motor magnet, a pair of contacts closed by an operation of said magnet, a pair of differential relays, means for completing a circuit for said motor magnet to operate the same, circuit means for said differential relays including said motor magnet contacts over which said relays are energized and one is operated, means controlled by said operated relay for opening said motor magnet circuit to restore

the magnet, said circuit means for said differential relays including means for operating the second relay upon the opening of said motor magnet contacts, means operated by said second relay for reclosing said motor magnet circuit to re-operate the magnet to reclose said contacts, means controlled over said differential relay circuit means by said second relay for restoring said first relay, control relays, circuit means for said control relays controlled jointly by said first and second differential relays, contacts on said control relays and circuits therefor, comprising, a chain circuit through which said motor magnet circuit extends to permit said control relay means to open the circuit of said magnet after a predetermined number of operations of the magnet.

13. In a totalizer system, a plurality of individual adding machines each comprising, an electromagnetically operated counter, storage relays and a connecting relay, a plurality of paths leading into each one of said adding machines there being a path for each value to be registered in the machine, a control unit common to said plurality of adding machines, a corresponding plurality of paths leading into said control unit, a total adding machine comprising, an electromagnetically operated counter, an accepting relay and storage relays, a total control unit therefor, a corresponding plurality of paths leading into said total control unit, means for connecting said total adding machine to a selected one of said individual adding machines over a selected one of said paths leading into said individual adding machine and for extending a circuit from ground to said common control unit over a corresponding one of said paths leading into said common control unit and for extending a circuit from ground to said total control unit over a corresponding one of said paths leading into the total control unit, means including the connecting relay in the selected one of said individual adding machines for connecting said common control unt to said adding machine, means in said control unit for operating said adding machine to register the value particular to the selected path, and means in said total control unit for operating said total adding machine to register the same value therein.

14. In a totalizer system, a plurality of individual adding machines, each comprising an electro-magnetically operated counter arranged to register two-unit values, storage relays arranged to store one-unit values and a connecting relay, a plurality of paths leading into each one of said adding machines including a path for one-unit values, a control unit common to said plurality of adding machines, a corresponding plurality of paths leading into said control unit, a total adding machine comprising, an electromagnetically operated counter arranged to register two-unit values and storage relays arranged to store one-unit values, a total control unit for said total adding machine, a plurality of paths leading into said total control unit including a path for one-unit values, means for extending a circuit from said total adding machine to a selected one of said individual adding machines over a one-unit value path leading into said individual adding machine, and for extending a circuit to said common control unit over a one-unit value path leading into said common control unit and for extending a circuit to said total control unit over a one-unit value path leading into said total control unit, means including the connecting relay in the selected one of said individual adding machines for establishing circuits from said common control unit to said adding machine, means in said common control unit for operating the storage relays of said adding machine to store a one-unit value therein and for operating the electro-magnetically operated counter in said adding machine when a previous one-unit value is stored in said storage relays, and means in said total control unit for operating the storage relays in said total adding machine to store a one-unit value therein and for operating the electro-magnetically operated counter of said total adding machine when a previous one-unit value is stored in said storage relays.

15. In a totalizer system, a counter, a magnet for operating said counter, a control relay group, a pair of relays included in said group, a circuit for said magnet extending through a chain of contacts in said control relay group, means for closing said circuit to operate said magnet, contact means closed by said magnet, circuit means controlled by said magnet contact means for operating a first one of said pair of relays, said first relay on operating locking itself and opening said magnet circuit to permit the magnet to restore, means for operating the second one of said pair of relays upon the restoration of said magnet to re-establish said magnet circuit to operate the magnet thereover, said magnet re-operating said magnet contact means to restore the first one of said pair of relays, means controlled by said pair of relays for operating the other relays of said control relay group in sequence to control the operations of said magnet, and means including a contact means in said chain of contacts controlled by the last one of said control relays to be operated for opening said magnet circuit.

HAROLD C. ROBINSON.

A676

[redacted]

June 23, 1964

Mr. Frank H. Basil, Vice President
The New York Racing Association, Inc.
P. O. Box 90
Cloche Park, Jamaica, New York

Dear Mr. Basil:

Along with our evaluation of manufacturers' proposals, we requested and received various information regarding the reliability of the proposed equipment. You have asked that we summarize our findings with regard to ticket issuing machines.

Statistics were supplied by American Totalisator and Automatic Totalisators regarding experience with their respective T.I.M.'s. American's figures were presented only in summary and classified into the following categories: 1) Machine Troubles, 2) Human Errors and 3) Questionable. The Automatic figures were in detail as well as in summarized form. Both sets of summarized figures appear below:

AMERICAN TOTALISATOR

Number of Machine-Races	Machine Troubles	Human Errors	Questionable
136622	110	85	207

AUTOMATIC TOTALISATORS

Number of Machine-Races	Electrical Troubles	Mechanical Troubles	Paper Troubles
135,000	21	45	39

7A32

BEST COPY AVAILABLE

In total numbers of troubles, American had 403 for 193,602 machine-races, or 0.213 per cent and Automatic had 105 for 121,000 machine-races, or 0.087 per cent. These figures appear to favor Automatic, but because of the differences in the way the troubles were characterized and in the relative sizes of the operations involved it is difficult to determine the true significance of these statistics. Prolonged tests under controlled conditions would be required for precise comparisons. Both of the above failure rates appear reasonable, and we feel that any true difference which might be measured in extensive tests would not be significant in choosing between total systems. Any acceptable system design must provide safeguards for the system against malfunctions of individual window machines. Any differences in TIM's reliability, therefore, becomes a matter of difference in maintenance effort.

Other references we have reviewed regarding TIM's concerned the Westbury system at Roosevelt Raceway. A report prepared for Westbury by Mr. Robert Frye of Touche, Ross, Bailey and Smart made reference to a number of malfunctions of TIM's. However, that consultant concluded that the failure rate was not abnormal. In another report by Hybrand Ross Bros. & Montgomery for California Course Racing Board, reference was made to specific standard equipment alignments as causes of malfunctions in Westbury machines. These were claimed to be corrected by Westbury. Automatic Totalisators has responded by stating: 1) their standard machine had been modified by Westbury in ways they felt undesirable, and 2) the machines were adjusted and maintained by personnel who were not sufficiently trained in this particular equipment.

We feel, because of these factors, that the machines presently in use by Westbury are not directly comparable with those of the proposed system. In addition, a newer and improved model of the Standard Automatic TIM is offered for use in the system proposed for NYRA.

Finally, we are informed that the State Tax Commission has concluded that the Westbury system, including the modified Automatic Totalisators TIM's, operates in a satisfactory manner.

We hope this will provide the information you require at this time and we shall be glad to answer any additional questions you may have.

Very truly yours,

A678

Meeting at Racing Commission Office on June 24, 1964

Re: Approval of Tote System

Presentation by E. T. Dickinson outlining events from 1959 to present. People in attendance introduced by Mr. Dickinson were:

Messrs. Don - Automatic Totalisator
Mack - Honeywell
Hughes - Data Trend
Lewis) Arthur Young
Hertzoli)
Birmingham)

Brady)
Dickinson)
Buell) New York Racing Ass'n.
Walger)
McCandless)

Walsh)
Walker)
Feeney) N. Y. State Tax
Milner)
Price - Budget Bureau

Cole, Chrmn.) N. Y. State Racing Commission
Hanrahan, Comsr.)

Mr. Cole stated that the State Racing Commission did not have any technical advisors on their staff for data processing and he would, therefore, have to accept the decision of the State Tax Department with an answer relative to approval of the proposed tote system.

Mr. Walsh asked when there could be an actual test to evaluate equipment and his department would go wherever this operation was being held, but he was directed that this equipment could only be approved after there had been a valid test of all component parts of the equipment. Mr. Don said that there was no equipment available at this time for a test as these were custom-built TIMS (550) and that his company would have to tool and

P862

manufacture and it would take at least twelve months for this to be accomplished. Mr. Hughes stated that Data Trend was doing the interface parts which were designed but not manufactured at this time. Mr. Block said that the Honeywell computer would be connected with the interface from Data Trend and the issuers from Automatic Toto. This of course would take several months. Mr. Walsh reiterated the fact that they would have to examine and test the completed portion of the entire system before the Tax Commission could give the approval. Mr. Bon then explained that the J10 issuer sold to Roosevelt Raceway had been modified by the Westbury Electronics Corporation before being placed in service but that, in general, our entire operation would be comparable to the Westbury Electronics with the exception that the computer would be Honeywell 200 instead of the Digitronics Tote.

Mr. Dickinson stated that we had the problem of time and to insure ourselves of this operation covering all companies concerned, we had engaged the firm of Arthur Young to study all proposals including all materials involved and to make a recommendation to NYRA as to their findings. This report was delivered to the State Tax Commission and the State Racing Commission, together with a proposal from Automatic Totalisator detailing all types of hardware to be used in this project. The various companies participating in this proposal were asked to comment. Mr. Block of Honeywell said they would be using the 200 series of Honeywell computer which is available and in operation in many areas. Mr. Hughes of Data Trend said that they had completed several installations for TWA, Teleregister, U.S. Air Command, and their interfacing for those jobs was similar to the hardware and programing in this particular job.

He also mentioned that this was custom-built equipment for a special on-line system which was to be manufactured in the near future but at this time was not ready for test.

Mr. Walsh stated that he was not questioning the reliability, etc., of this equipment, but he again stated that before there could be an approval by the State Tax Department there must be an on-line test conducted by the State Tax Department. Mr. Dickinson stated that if we wish to proceed, the State Tax Department has left us a choice of two companies to do business with; namely, the American Tote and the Westubry Electronics. He then asked permission to proceed with the proposed contract of the Automatic Tote Company. Mr. Cole said that the State Racing Commission must go along with the Tax Department in that the equipment would have to be tested before approval could be given. Mr. Dickinson then asked if permission could be granted with tests to be held later to satisfy both commissioners. Again the Racing Commission stated that they would not approve until the Tax Commission approved the equipment and Mr. Cole stated that he would like to see things go on as is but he realizes changes must be made.

Mr. Boa was asked by Mr. Walsh whether they had any operations in which they were using computers instead of electro-mechanical operation. Mr. Boa's reply was that the only operation with computers in the world by his company was the operation at Westbury which utilized issuers from his company.

Mr. Price of the Budget Bureau asked if there would be a compromise and/or we could give them a rough estimate of how soon they could have a test. Mr. Block said just what would be needed for

this test or approval and with no immediate answer, it was then suggested 20 TDCS, one scanner and one 200 Honeywell. There was no time limit for such a test. Mr. Block and Mr. Boa both said that they were quite confident they could have a full-scale test by some time in September 1965 in which all hardware would be in operation. Mr. Walsh asked when programing would start and then be completed. The answer was that programing would begin on July 1, 1964 and run continuously and be completed before September 1965.

Mr. Price then stated that he was completely in agreement with Mr. Walsh of the Tax Department that there could be no approval until the system was tested by the Tax Department. Mr. Boa then recited that he had been a CPA for 25 years, in the tote business for 40 years, and the first tote of his company was in 1927 at Hialeah, that his company serviced tracks in 27 countries throughout the world and the full reliability of the parent company would be the guarantee behind this project. Mr. Cole then stated that it was not necessary that this answer be given at once but somewhere along the line. Mr. Block stated that if the State men present wanted to examine or write their own program and test the Honeywell 200, he would be very happy today to take them on East 43rd Street where they could run any type of test on the Honeywell computer they might desire. This offer was declined by Mr. Walsh and again he stated they were not there to examine any parts of the operation but when the operation was fully built and ready for service they would run their test. He was asked if he could detail what a test would encompass and he then mentioned several items that the State would go through and the operators at that

time would be told how many tickets to punch, they would check as to their recordings and get printouts from the computer operation. He said that this was generally what their test would encompass, but did not state that this was the entire procedure by the State prior to approval.

The meeting adjourned.

A683

DATA TRENDS, INC.
1259 Route 46 Parsippany, New Jersey 07054
Tel. (201) 334-1515

December 6, 1965

Mr. L.M. Walger, Jr.
Mutuel Director
New York Racing Association
P.O. Box 90, Ozone Park
Jamaica 17, New York

Dear Mr. Walger:

Enclosed is a technical memorandum which describes the problem which caused the computer to hold during our first demonstration on November 22.

You will note that the trouble has been completely identified and corrected. Further, due to the nature of the trouble, it is now clear that if this event had occurred during normal tote system operation, recovery would have been complete with no loss of data or betting.

If you should desire any further information, please do not hesitate to call upon me.

Yours truly,

J.B. Hires

J.B. Hires
Director of Operations

JBH/kd

Enc. (1)

cc: K. Dodwell
O. Rye
J. Egglezos
R. W. Hughes

P908

A684

DATA TRENDS, INC.
MEMORANDUM FOR FILE

P. J. GIBSON, Jr.
30 November 1965

PJG - 20

SUBJECT: Problem of November 22nd [illegible] Demonstration

INTRODUCTION

Very early in the demonstration of November 22nd a problem arose which caused the computer to halt. At this time, the system was displaying data on the high speed printer on the other computer system was not functioning properly. It should be noted that had the normal duplex configuration been in use, the computer system which halted would have been taken off-line and the other computer system would have continued to operate the data system. The third computer system would have been brought on-line and duplex operation resumed within a very short time.

DESCRIPTION OF PROBLEM

As soon as the computer halted a careful examination of memory showed that some characters in memory had been changed. Upon further study of these effected characters, it was realized that they had the special code used for board polling and readback. This discovery led to the conclusion that a certain control bit sent to the Board Control Unit (BCU) was lost causing the BCU to read data into the wrong area of memory. With memory thus modified the subsequent halting of the computer is not unexpected.

CORRECTIVE ACTION

The BCU logic has been modified in such a way as to guarantee the termination of the polling and readback functions within the proper areas of memory. Certain control signals are repeated several times to force the BCU to release from the computer. Reception of any one of these control signals will cause the BCU to stop. Deliberate efforts to mix up the BCU were made by special programs and also by manual means. In all cases the BCU properly terminated the orders, freeing the computer without effecting areas of memory.

PJG:lmr

cc: J. B. Hires
H. J. Malmholz
M. R. Scheinberg

BEST COPY AVAILABLE

CABLE ADDRESS
MAIL STATE WILMINGTON

HEAD OFFICE
SYDNEY, AUSTRALIA

A685

Automatic Totalisators (U.S.A) Limited

TOTALISATOR ENGINEERS AND OPERATORS
3010 BELLEVUE AVENUE
WILMINGTON 2, DELAWARE

TELEPHONE PORTER 2-2785

AREA CODE 302

July 28, 1966

NA: 3662
NN: VB

Mr. Louis M. Walger, II
Director of Pari Mutuel Betting
The New York Racing Association, Inc.
P. O. Box 90, Ozone Park
Jamaica 17, Long Island, New York

Dear Mr. Walger:

Keith Dodwell asked me to forward the enclosed copy of a Montreal newspaper clipping dated Monday, July 25, 1966, concerning Blue Bonnets.

Mr. Raymond LeMay called Keith yesterday to say that Joe Lease had enlisted the aid of the Westbury crew to see if they can't straighten out his problems.

The track has cancelled out the Thursday, July 28, re-opening till Monday, August 1, on the provision that all tests on Thursday, July 28 are 100%. If the tests are not 100%, Mr. LeMay has had instructions from the Blue Bonnets Directors to have the Western Tote removed and to re-open Richelieu Park for Harness Racing.

Keith thought you might be interested in this development.

Kind regards,

Very truly yours,

AUTOMATIC TOTALISATORS (U.S.A) LTD.

Norman Noble
Assistant Vice President

Enclosure

GOVERNMENT EXHIBIT

2719a

BEST COPY AVAILABLE

Open And Closed: Thoroughbred racing had hardly opened at Blue Bonnets Friday and Saturday before the track management announced suspension of racing for three nights due to problems with the mutuel machines. This was the scene Saturday night, showing the clubhouse, new multi-million dollar grandstand and the horses in the stretch of the fourth race.

(Gazette Photo Service)

PLAINTIFF'S EXHIBIT
U.S.A.

THEY'RE OFF (REALLY OFF) AT BLUE BONNETS

After repeated breakdowns in the mutuel betting system, thoroughbred racing has been suspended for at least three nights at Blue Bonnets.

The decision to cancel programs for Monday, Tuesday and Wednesday was made at an emergency meeting of Bonnets directors following Saturday's card, to which 15,400 fans were admitted without charge.

When the racing plant, renovated at a cost of $6,460,000, opened Friday for the start of the 56-night thoroughbred meeting, it was a case of continual confusion at the betting windows. Time after time the electric-electronic mutuel machines broke down with the result that even winners were dissatisfied.

Technicians of the Western Totalisator Co., which controls the system, worked almost 24 hours in attempts to have it in order for Saturday's program. However, they were unsuccessful and [illegible] on a last-minute decision to do so, instead of calling it off.

Admission fees to both the new grandstand and the clubhouse were washed out and patrons were advised of the possibility of a cancellation of wagering should the mutuel machines break down altogether during the

By Pat Curran

evening if such had been the case, the eight-race card with $18,300 in purses would have continued without wagering.

As things turned out Saturday, enough betting windows were open to bring a total handle of $295,667 far below normal for such a large crowd

[illegible] the interest of the public [illegible] a real [illegible] that

suspend operations for a few days in order to give the Western Totalisator Co. another chance to get things working properly. The mutuel system is on a leased basis and Blue Bonnets is not responsible for its operation."

Management hopes to resume the meeting Thursday night. The cancellation was made in accord with federal and provincial authorities and the three open dates this week will be added to the end of the meeting, originally scheduled to run through September 24.

Several reasons have been advanced for the problems in the mutuel system on which a reported $80,000 was spent this year to have it ready for the larger crowds and heavier wagering expected at renovated Blue Bonnets.

Most logical explanation appears to be the combined operation of the electric-electronic system with that of an electronically-operated sign-up [illegible]